The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXIII. No. 590 | OCTOBER 18, 1930 | Prepaid Annual Subscription: United Kingdom, £1.1.0; Abroad, £1.6.0

Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to THE CHEMICAL AGE *is 21s. per annum for the United Kingdom, and 26s. abroad. Cheques, Money Orders, and Postal Orders should be made payable to Benn Brothers, Ltd.*

Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE, *have for some years past adopted the five-day week, and the editorial and general offices (Bouverie House, 154, Fleet Street, London, E.C.4), are closed on Saturdays.*

Telegrams: "Allangas, Fleet, London." Telephone: City 0244

Chemical Trade Figures

WITH three quarters of the year gone, the overseas trade figures of the chemical industry continue to act as an indicator of the prevailing trade conditions. Fortunately there have not been, as in other of our industries, any violent reversals, but rather a general shrinkage of business, amounting over the nine months to roughly £2,000,000 both in the case of imports and exports. The balance of trade remains, however, heavily on the right side. Coal tar products appear to be making a progressively smaller showing in the export lists and for the first nine months of this year amount to only £888,575 compared with £1,292,699 for the corresponding period of 1929 and £1,916,343 for the nine months of 1928. Trade in almost all coal tar products has diminished, but in particular exports of tar oil and creosote oil which, during the two years, have shrunk by seven and a half million gallons for the first nine months.

Ammonium sulphate exports have advanced considerably in quantity, but declined in price. No exports of this commodity to Japan were registered last month, compared with over 12,000 tons in September, 1929, but greatly increased exports to Spain and other countries have more than atoned for this loss. Over the nine months a heavy decline in the Japanese trade—the result of important manufacturing developments and over production in that country—is just cancelled out by the increased demands of Spain. The Japanese output of sulphate of ammonia, as was indicated in the recent Report on Economic Conditions in Japan, which appeared in our issue of a fortnight ago, will increase yearly as new plants come into operation. Estimates of the total production by 1935 vary from 750,000 tons to as much as 1,200,000 tons. Meanwhile, however, foreign competition, combined with other economic trends, remains a very serious factor in Japan, and while manufacturing capacity is being increased there, output is being curtailed.

Empire Supplies of Helium

As Mr. Rex Furness points out in his article on helium, which we reproduce in this number, chemists will await with almost a personal interest the results of the official inquiry into the R101 disaster, and we may expect to hear what investigations, if any, have been taking place since the early post-war experiments and survey of the helium resources of the British Empire. Whatever be the new attitude of the United States—and President Hoover has declared this week that the U.S. Government are anxious to encourage rather than hamper the exportation of helium—the development of Empire sources of the gas, it is to be expected, will now be tackled with redoubled energy if airship development is being persevered with in this country.

The availability and the cost of helium have been the subject of much loose writing during the past fortnight, and it is therefore valuable to recall some of the figures obtained by Professor McLennan's Survey in 1919, and the figures recently published as the result of the first year's working of the new United States Government plant near Amarillo, Texas. Natural gas in Texas yields about 2 per cent. of helium and over twenty million cubic feet of pure helium can be produced a year, at a cost, it is stated, of £5 per 1,000 cubic feet. Mr. Furness, incidentally, expresses a reasonable doubt as to whether this figure can include any charge for the large sums spent in development work.

The richest natural gases found within the empire contained only 0·34 and 0·33 per cent. in Ontario and Alberta respectively. From the work of an experimental station it was thought that a plant for working the whole supply from the Alberta field would cost less than £150,000 and the gas could be produced for under £10 per 1,000 cubic feet. The two Canadian sources, it was estimated could supply between ten and twelve million cubic feet of helium per annum. Natural gas from New Zealand was found to contain not more than 0·77 per cent. of helium, and the Government Chemist's report for the past year records that two samples from South Africa examined for the Air Ministry contained only negligible amounts.

An important factor in the use of helium for airships, has been stressed by United States experience, in its relative cheapness in operation, which can be set off against greater initial cost. Diffusion of air through the gasbags forms, in the case of hydrogen, a highly explosive mixture, necessitating the deflation of the gasbag and refilling with new hydrogen. As no safe and cheap method of purifying the hydrogen exists, it is allowed to escape into the air. With helium, on the other hand, diffusion of air merely means decreased lift, and the gas can be easily purified. New helium required over a year's operation is only about $1\frac{1}{2}$ times or twice the volume of the ship compared with eight to ten times the volume of hydrogen.

A Lost Scent

At Bristol Professor Bower started botanists, and, indeed, all of us who have noses, on a hue and cry after the perfume of the garden musk which, mysteriously, completely, and universally lost its scent a few years before the war. As an example of a sudden and universal mutation, this happening, when fully investigated, may lead to all sorts of discoveries; it has already aroused interest in those wider circles to which, as often before, the deeds of the chemist are not familiar. A leader writer in a contemporary challenges us to provide a synthetic substitute against the day when the musk deer is extinct and its gland extract lacking from the perfumer's window. The chemical story is worth the telling, but first a word or so of explanation. The term musk is derived from the Sanskrit word meaning scrotum; it was originally given to the perfume obtained from the gland of a deer and hence applied to the deer itself and later to other animals and also to plants possessing a similar odour. Its function in perfumery, as is well-known, is to give strength and permanency to the essential oils of plants.

The musk of the deer contains a liquid ketone, first isolated from it by Walbaum, which is remarkable in containing a ring of fifteen carbon atoms. Somewhat similar in this respect is the unsaturated ketone civetone, obtained by Sack from the civet cat, which contains no fewer than seventeen carbon atoms in one ring. Such large carbon ring ketones have been the subject of very thorough study by Ruzicka during the last few years; he has prepared them by heating the thorium salts of the dibasic acids of the long chain fatty acids. It is of interest to note in these substances how the odour changes as the molecular weight of the ketone increases. Those with 10, 11 and 12 carbons have the odour of camphor. In the higher members, when in considerable concentration, the odour of cedarwood becomes increasingly apparent. In greater dilution both the C_{14} and C_{15} members have the odour of musk, whereas with 16, 17 and 18 carbons the civet odour prevails. Cyclopentadecanone is actually being made as a musk substitute under the name of Exaltone, genuine muscone being β-methyl exaltone, but we have shown that the chemist knows how to ring the changes in perfume even beyond nature. Before we leave these ketones, it is fascinating to point out the possibility of the conversion of oleic acid into civetone in the living cell.

The musk odour of plant oils is due, not to ketones, but to the corresponding lactones with many carbon rings. Ruzicka has been able to oxidise all his ketones to lactones identical with the vegetable musks, and Kerschbaum has proved musk kernel oil to be an unsaturated lactone of a 16 carbon ring. So plant and animal perfume, though not the same, are very closely allied. The artificial musk of commerce is, however, something quite different, though its odour is similar to that of natural musk. First obtained by Baur as long ago as 1888, it has the formula of a symmetrical trinitro butyl toluene; apparently the odour depends on the symmetry of the three nitro groups.

We deplore the loss of the perfumed musk from the cottager's garden, we rejoice that eminent plant hunters are setting out to rediscover it and reintroduce it as a novelty at Vincent Square at some future date. But the perfumer need neither wait nor despair: musk scent he can have in abundance and even in variety, and civet, too. The chemist has accepted the challenge.

"Unemployment and Work"

We have had several inquiries from our readers since Sir Ernest Benn's series of ten articles on "Unemployment and Work" appeared in The Chemical Age, during May, June and July this year, asking whether these articles could be collected and published in book form. We are pleased, therefore, to announce that they are now available as a booklet in the Criterion Miscellany, published by Faber and Faber, Ltd., 24, Russell Square, London, price 1s. The title, "Unemployment and Work," is retained, together with the title of each article as it appeared.

The Calendar

Oct.		
20	Institution of the Rubber Industry (London Section): "The Future of Industrialism." Professor F. W. Burstall	Institution of Civil Engineers, Great George Street, London.
20	Institute of Chemistry and Society of Chemical Industry (Edinburgh): "Some By-ways of Chemistry and Industry." George F. Merson. 7.30 p.m.	36, York Place, Edinburgh.
21	Society of Dyers and Colourists (Huddersfield Section): "Artificial Daylight."	Huddersfield.
22	Institute of Chemistry (Birmingham and Midlands Section): Opening Social, Concert and Dance.	Grand Hotel, Birmingham.
22	British Science Guild: Alexander Pedler Lecture. "Science Discipline." Sir David Prain. 5.30 p.m.	Liverdool.
22 & 23	Institute of Fuel: Conference.	Institution of Electrical Engineers, Lecture Theatre, Savoy Place, London.
	Annual Dinner and Dance. 6.45 p.m.	Connaught Rooms, London.
23	Chemical Society. 8 p.m.	Burlington House, Piccadilly, London.
23	Society of Chemical Industry (South Wales Section): Annual Smoking Concert and Social. 6.30 p.m.	Royal Hotel, St. Mary Street, Cardiff.
24	West Cumberland Society of Chemists and Engineers: "Commercial Testing of Materials." F. L. Atkin. 7 p.m.	Workington.
24	Society of Dyers and Colourists (London Section): "The Future of the Dyestuff Industry—Have We Fought in Vain?" Dr. E. F. Armstrong. 6.45 p.m.	Dyers Hall, Dowgate Hill, London.

Helium Resources within the Empire

By Rex Furness

In the following article Mr. Rex Furness alludes to the personal and professional interest which chemists feel in the matter of the production of helium in sufficient quantities for the filling of airships. He recalls some findings of the survey of helium resources within the British Empire made shortly after the war, and provides an interesting comparison of production costs from the natural gas supplies in Canada and the United States.

THE tragedy of R 101 has not passed into the limbo of things forgot after a nine days' sorrow and, fantastic as it may seem, many chemists are feelng a kind of personal or professional responsibility in the fact that the airship was not filled with helium.

This is not the time nor the place, we believe, to ask *why* helium was not employed, since in due course we shall have evidence upon which to base an opinion. Many irresponsible statements have appeared in the general Press, and it has even been inferred or stated that it is regrettable that motives of economy should have been allowed to exclude the use of helium. Helium is costly, it is true, but we have not found a single correct estimate of the expense which would have been incurred in filling R 101 with the non-inflammable gas. We are sure of this, that our experts were in full possession of all relevant facts, and we are content to wait the results of the promised official inquiry. We shall then be able to come to no uncertain decision.

Helium was first " discovered " in the sun about the middle of the nineteenth century, and towards the end, in certain spring gases and later in the atmosphere, where it exists in minute quantities—there is less helium in our air than there is gold in sea water. Certain natural gases, as we shall indicate more fully later, contain up to 2 per cent. of helium, and supplies of such gas are relatively abundant.

Application for Airships

With regard to its application for the filling of airships, the following brief facts may be given. Airships have been successfully filled with helium and have behaved normally in so far as the lifting gas was concerned. Helium has about 90 per cent. of the lifting power of hydrogen, but it is absolutely non-inflammable.

As it is expensive, " valving " in order to decrease the upthrust of the ship as a whole cannot be regarded as desirable. Now, an airship on a long flight normally becomes lighter by reason of the fuel burnt and the discharge of products of combustion. Ordinarily, therefore, release of some of the lifting gas rectifies the situation. With helium-filled ships, an arrangement has been devised and successfully operated whereby the water produced by the combustion of the fuel is condensed and collected. The weight of water readily collected is sufficient to compensate for the weight of fuel burnt and ordinarily lost.

The permeability of balloon fabrics to helium and air has been fully studied, and no great diffusion of air into helium need occur. When, however, the lifting helium is contaminated by the air diffused through the envelope, it can be rectified and need not be discarded.

Much more for and against the use of helium could be written, and doubtless much more will be said in evidence later, so that our present purpose will best be served by passing on to a consideration of the actual manufacture of helium in the United States and possible sources within the Empire.

During the war and up to about 1920, over a million pounds was spent in America upon plants for the winning of helium from Texas natural gas, and at one time it was seriously considered impossible ever to obtain sufficient quantities at any reasonable price. The cost in 1920 to fill a ship would have been greater than the whole cost of the rest of the construction. The matter was not dropped, however, and to-day the U.S. Government plant is able to produce twenty million cubic feet of pure helium per annum at a cost which is stated to be not more than £5 per 1,000 cu. ft.

The U.S. Government Plant

The following account of the helium process is summarised from a recent issue of our contemporary, *Chemical and Metallurgical Engineering.*

The new helium plant of the U.S. Government is located on an 18-acre site some seven miles from the town of Amarillo, Texas, and the first year's working has recently been successfully completed. The field produces gas containing nearly 2 per cent. of helium, and after helium extraction the residual gas is sold to a gas company for domestic and industrial consumption in the city of Amarillo.

Removal of carbon dioxide is the first stage in processing the natural gas, as otherwise much trouble would be experienced in the cold elements of the helium plant ; and, after this has been done continuously by means of potassium carbonate solution, the gas, still under its natural high pressure, is conveyed to the building in which the helium is actually removed. The gas coming to the separation building consists chiefly of methane, ethane, nitrogen, and just under 2 per cent. of helium. In order to separate the helium in a sensibly pure state, it is necessary to cool the mixture to a very low temperature. The fact that the gas reaches the plant from the field at a pressure of over 650 lb. per sq. in. obviates the necessity of further compression.

Separation from Other Gases

Practically all the gas which enters the plant at ordinary temperature is sufficiently cooled by expansion, and helium is separated from the other gas constituents now liquefied. The gas is brought to room temperature through heat exchangers which cool the incoming gas. The complete operation from room temperature to around 300°F. below zero and back to room temperature takes place, for any given cubic foot of gas, in a total lapse of time of less than a minute. During the process, a small amount of nitrogen is also removed from the mixed gases and sent to a gas holder to be used in the refrigeration cycle. This nitrogen is liquefied in a separate section of the plant and is used to make up for a portion of the heat losses in the whole system and to furnish the necessary low temperature for helium purification. Since considerable cooling is obtained by expanding the natural gas from its original 650 lb. to the "return" gas pressure of 75 lb., not much "outside" refrigeration is needed from the expansion engine (in the liquid nitrogen section of the plant) after the helium separation plant has reached a steady operating condition.

The helium produced may vary in purity from 40 to 80 per cent., and is therefore further purified up to around 98 per cent. purity by further compression, drying, and cold rectification.

The helium is shipped from the plant either in tank cars or small cylinders. The tank cars consist of large, heavy walled seamless steel tanks mounted on rail trucks and are filled to a pressure of 2,000 lb. when they hold about 200,000 cu. ft. of helium. The small cylinders contain 170 cu. ft. of helium under a pressure of 1,800 lb.

America is the only country in the world which is producing helium in amount. What has been done in the matter of looking around for potential supplies from Empire sources?

Professor McLennan's Survey

Very soon we may be told of great activities of which nothing has been recorded—or we may find there have been no great efforts made—but certain established facts and estimates were arrived at during the later years of the war and in the years immediately following. We abstract these without comment from a lecture given by Professor McLennan to the Chemical Society on June 17, 1920.

Within the British Empire no natural gases have been found to contain as much as 0·5 per cent. of helium. When during the war it became apparent that the use of helium would have an important advantage over that of hydrogen for filling airships, the Board of Invention and Research of the Admiralty asked Professor McLennan to undertake a survey of the resources of helium within the Empire and to devise ways and means of isolating it in quantity and in a relatively pure state. Natural gases from Ontario and Alberta, Canada, were found to be richest in helium—0.34 and 0·33 per cent. respectively—and it was estimated that these sources could supply from 10 to 12 million cu. ft. of helium per annum.

Gases from New Brunswick showed only 0·064 per cent. and the richest natural gases in New Zealand not more than 0·077 per cent.

Plant at Ontario and Alberta

In 1917 a small experimental station was set up at Hamilton, Ontario, where it was found that the helium present in the crude natural gas to the extent of 0·33 per cent. could be satisfactorily isolated. A second station was built to operate on the natural gas at Calgary, Alberta. By suitably modifying the Claude oxygen-producing column it was found that helium of 87 to 90 per cent. purity could be regularly and continuously produced. Ultimately an auxiliary apparatus was added whereby the purity was raised to 99 per cent. of helium. From the experience thus obtained, it was possibe to draw up specifications for a commercial plant to deal with about 56,000 cu. ft. of gas per hour at normal temperatures and pressures. Six of these machines would deal with nearly 10 million cu. ft. daily, the average supply of natural gas at Calgary. The costs of a commercial plant for treating the whole supply from the Alberta field would probably be less than £150,000—it was estimated—assuming an efficiency of 90 per cent., and allowing for salaries, running costs, amortisation, etc. Helium could be produced in Alberta, it was considered, at less than £10 per 1,000 cu. ft., excluding the cost of cylinders and transport. The potential yearly supply of helium from all sources within the Empire—then surveyed—would not suffice to keep more than a few of the (then) larger airships in commission.

We need only summarise the position. America is producing helium at a stated cost of £5 per 1,000 cu. ft., but this figure cannot surely include a charge in respect of the large sum spent in development work. Empire helium it was thought in 1920 could be made at £10 per 1,000 cu. ft., although our richest natural gases do not contain by any means so much helium as the Texas gases. All chemists will await further information with interest not unmixed with anxiety.

Inorganic Vehicles for Paints

By Noel Heaton

"Some Possibilities of Inorganic Paint Vehicles" was the subject of a paper read before the Manchester Section of the Oil and Colour Chemists' Associations by Mr. Noel Heaton, president of the Association, on Friday, October 10.

THE various types of vehicles or media used in the paint industry at the present time, said Mr. Heaton, were well known. Speaking of them collectively and in the broadest terms to include every type, from distemper to enamel and lacquer, they all depended upon the employment of some inorganic compound to produce the film which formed the final coating on the object, and which served the dual purpose of protection and decoration, either alone, as in the case of varnishes, or as a binder for pigments, as in paints and enamels. Such films possessed well marked advantages and were eminently satisfactory for many purposes, but they possessed limitations which were inherent and rendered them, he would not say entirely unsuitable, but not exactly satisfactory for some classes of work.

Fresh Line of Research

The question he proposed to discuss was how far it was possible to overcome the practical difficulties resulting from these limitations by striking out a fresh line of research. Instead of attempting to coerce organic substances into filling a rôle which Nature never intended them to fill, was it possible to produce vehicles which would not be subject to the same limitations? Anyone who imagined he was going to provide a complete answer to the question and tell them of a perfected method of solving this problem would be disappointed. The limitations he had referred to were well known. The life of organic substances under normal conditions was strictly limited. On exposure, progressive change took place, slowly or quickly according to the conditions, which resulted in the paint only serving its protective or decorative function for a limited period.

They knew, for instance, in the case of drying oils that the oxidation of the oil which gave it its valuable quality of changing into a solid on exposure to the air did not stop with the formation of the film but continued, with the ultimate result that the film disintegrated.

Organic films were only stable within a limited range of temperature, particularly in the presence of moisture. A dry temperature of about 300° C. was the maximum. There were many conditions where it would be a great advantage to extend this range, as in the case of the decoration and protection from corrosion of flues and gas stoves. One heard a lot about fireproof paints but, said the author, in his experience they were a pious hope rather than an accomplished fact. Usually their preparation was based on confustion of thought, the idea being that if you used a fire-resisting pigment such as silica the paint would be fire-resisting. He remembered years ago a fireproof paint for the decoration of safes based on the incorporation of Paris white, the idea being that on heating it would give off carbon dioxide, which was supposed to prevent decomposition of the paint if it did not put the fire out. Lack of resistance to heat, plus moisture, was instanced by the difficulty of keeping enamelled baths in good condition for any length of time. Apart from heat, the decay of organic films was accelerated by continued exposure to moisture, and in conditions of constant humidity they had the added attack of bacteria and fungi. The limited life of paints in greenhouses and hot-houses was a case in point, an extreme case being the rapid decay of paints in humid tropical climates like the West Coast of Africa. Then they had the case of exceptional conditions of exposure, as in chemical laboratories and factories, where exposure to the fumes inevitable to the work caused rapid destruction of the film.

It was to fill conditions such as these that the need for extending the life of the decoration was indicated because of the difficulty of disturbing the place in re-decoration. The failure of organic films to stand up to chemical action was instanced in the case of hospitals and breweries, where antiseptic conditions were essential. Great advances had been made in recent years in mitigating these limitations, and reference was made to ester gums and synthetic resins, for which great credit was due to the paint chemist. In the author's opinion, however, the best of these was a panacea rather than a cure. There had also been a tendency towards cutting the Gordian knot by substituting other methods of decoration, for example, stainless steels and non-rusting alloys, ceramics and glazed tiles, and the use of vitreous enamels for baths, kitchen tables, and gas stoves. All these, however, were of limited application. Vitreous enamelling was limited to metals and could not be applied to articles *in situ* as the temperature required was 700° C. There was a definite demand for a material which could be applied like paint, but which would remain unchanged indefinitely and would resist heat and chemical action and be compatible with moisture. In speculating as to what prospect there was of finding such a material, they might start with the assumption that if it was not entirely organic it must leave an inorganic film.

Silicon Esters

In the course of a lengthy survey of past work in this field, Mr. Heaton referred to the suggestion by Laurie in 1923 of silicon esters as stone preservatives, their preparation being taken up by Albright and Wilson. Then in 1925 Thomas Wilson drew attention to the possibility of silicon ester being used as a paint vehicle. Further investigations on this subject were carried out by Mr. George King who, in a paper read before the London Section of the Association last session, dealt very fully with the constitution of the various silicon esters and their possible uses. Briefly, silicon ester was produced by the action of alcohol on silicon tetrachloride, when the alcohol radicle and the silica radicle combined to form an ester. For use as a paint vehicle this was partially hydrolysed by agitation with a solution of alcohol in water, the final result being a combination of silicon ester in solution with colloidal silica. A vehicle prepared in this way could be mixed with pigments to form paint. Applied to the surface, the

alcohol evaporated leaving the pigment held to the surface by silicon ester plus colloidal hydrated silica. This remained soluble in alcohol for some time so that the painting could be altered or removed if necessary. In the presence of moisture, the ester hydrolysed, releasing alcohol, which evaporated, and silica. Finally, they had nothing but silica left, which gradually hardened and dehydrated until the pigments were left bound to the surface by a film of silica in a condition comparable with that of agate. This fulfilled all the conditions of resistance which he had indicated. The initial drying of the paint took a few minutes, the change from the soluble to the insoluble condition a few hours, but the final hardening must be gradual to ensure complete stability in the finished film. Mr. King, in his paper, gave a maximum of four months to attain complete stability. The author said that the reaction offered the nearest approach to the solution of the problem of painting on plaster and cement. Whilst he was not prepared to say that silicon ester was a complete answer to the question, the process went a long way towards solving some of the branches of the problem.

Overcoming Instability

Perhaps the greatest of the limitations to its use was that the complex solution was not perfectly stable; gelation was liable to occur on keeping, particularly after mixture with pigments. Great progress had already been made in this direction. In the early days, the solution by itself was liable to get into a solid jelly after keeping for a few weeks. This difficulty had been largely overcome, but it was desirable to mix the pigment and vehicle on the job, which was a decided limitation for general use. Owing to the limited elasticity of the silica film, the process was only really satisfactory with porous surfaces such as plaster, where penetration ensured a good key. It was not generally applicable to non-porous surfaces, wood and particularly metal surfaces, as the shrinkage of the film by the hardening of the silica caused crazing and flaking.

Mr. Heaton said he was optimistic as to the possibilities opened up by silicon esters. He did not consider the limitations which had been indicated as fundamental, and believed that the difficulties of application would be solved by experience and co-operation between maker and user, and by the development of a special technique. The extension of satisfactory application to materials like wood and metal was a matter of further research. The main trouble was the elasticity of the film and the difficulty was closely parallel to that of cellulose esters where research showed how to prepare low viscosity esters. The question was whether it was possible to find an inorganic plasticiser to control the final condition of the silica film. After all, the compounds of silicon in inorganic chemistry played a rôle very similar to that of carbon in organic chemistry, but the possibility of these inorganic compounds had not been so exhaustively studied. It did not seem to be beyond the bounds of possibility that compounds might yet be discovered which would result in similar progress to that which took place recently in cellulose esters. There was also the possibility of following up further Ebelman's work on boron esters. Referring to titanium esters and similar products, the author said it did not do to stress parallels too far, but they knew that in glassmaking the partial replacement of silica by boron oxide gave valuable properties to the glass which were difficult to obtain otherwise. The same might be said of titanium oxide, although in a different direction.

Production of French Urbain Co.

In addition to activated carbons, writes the U.S. Assistant Trade Commissioner in Paris, the French Urbain Co. is producing large quantities of phosphoric acid for use in the manufacture of sodium phosphate, ammonium phosphate, and in such fertilisers as ammonium-potassium-phosphate and ammonium-magnesium-phosphate. Present plant equipment is sufficient for the production of 3,000 metric tons of disodium phosphate annually. Trisodium phosphate has never achieved the popularity in France expected by its producers. The company has also set up a plant for the production of pure ammonium phosphate used as a yeast food for winemaking and has also studied the production of industrial grades of ammonium phosphate.

Perkin Memorial Plaque

Presentation to Chemical Society

We publish below an illustration of the Perkin Memorial Plaque which has been presented to the Chemical Society by the Perkin Memorial Fund Committee and was unveiled by Mr. A. J. Greenaway at the Rooms of the Society, Burlington House, Piccadilly, London, on Thursday evening. An accountof the ceremony and the oration by Professor W. N. Haworth on the life and work of Professor W. H. Perkin will appear in The Chemical Age next week.

The plaque, which is the work of Mr. Ernest Gillick, is in bronze and bears a life-size head of Professor Perkin in profile,

(Sculptor, Ernest Gillick)

surrounded by the words "William Henry Perkin, D.Sc., LL.D., F.R.S., Waynflete Professor of Chemistry in the University of Oxford. A tribute from his students and colleagues. MDCCCLX–MCMXXIX." Mr. Gillick, it will be remembered, was responsible for the rearrangement of the landing at the Chemical Society's Rooms, including the War Memorial of the Society and the Harrison Memorial, effecting a great improvement in the appearance of the landing and one that has given a lasting satisfaction to members. Notable examples of his work are also the James Adam Memorial at Emmanuel College, Cambridge, and figures at Winchester College.

There is a copy of the Perkin Memorial Plaque at Manchester University, where Professor Perkin was Professor of Organic Chemistry, and another is to be unveiled at Oxford University.

British Acetate Silk Corporation, Ltd.

Compulsory Liquidation Petition Adjourned

Mr. Justice Maugham, in the Companies Court on Monday, had before him the petition of Johnson and Phillips, Ltd., electrical engineers and cable manufacturers of Columbia House, Aldwych, W.C., for an order for the compulsory liquidation of the British Acetate Silk Corporation, Ltd.

Mr. E. T. Hecksher, for the petitioning company, said their debt was £754, and this was their second petition, the first being dismissed by consent in June on the understanding that the respondent company would bring forward a scheme of arrangement within six weeks, but this was not done. He understood, however, that an elaborate scheme was now being prepared.

Mr. Montagu Gedge said he appeared for the respondent company and 262 creditors for £140,000, and he opposed the petition. A scheme was being prepared, but it would take a good deal of time before it was ready for presentation to the court. A receiver of the company had been appointed, and its works had been closed down for the time being.

His lordship adjourned the petition for six weeks.

British Chemical Overseas Trade for September

Smaller Figures than Last Year

THE Board of Trade returns of British overseas trade during September show that chemical trade continues on a smaller scale than in the corresponding month last year. Imports during the month totalled £1,053,461, a decline of £207,574 compared with September 1929, exports were £1,605,961 (£295,515 lower), but re-exports at £76,883 showed an increase of £17,333. Over the full nine months of this year imports have dropped £1,851,120 and exports £2,006,779 compared with the corresponding period of 1929.

Imports

	Quantities Month ended September 30, 1929.	Quantities Month ended September 30, 1930.	Value Month ended September 30, 1929. £	Value Month ended September 30, 1930. £
CHEMICAL MANUFACTURES AND PRODUCTS—				
Acetic Anhydride . . cwt.	Tons	96	—	418
Acid Acetic . . . . tons	2,285	435	80,533	16,805
Acid Tartaric . . . . . . cwt.	2,183	2,565	15,042	13,580
Bleaching Materials ,,	12,622	8,815	12,842	12,023
Borax . . . . ,,	27,383	9,800	15,588	6,250
Calcium Carbide . . . ,,	67,875	84,130	40,427	49,267
Coal Tar Products . value	—	—	6,474	55,975
Glycerine, Crude . . . cwt.	2,673	787	4,438	1,716
Glycerine, Distilled ,,	981	1,427	2,345	3,296
Red Lead and Orange Lead . . . . cwt.	3,003	4,415	4,551	6,508
Nickel Oxide . . . . . . ,,	64	206	299	1,079
Potassium Nitrate (Saltpetre) . . . . cwt.	14,392	7,535	13,415	6,841
Other Potassium Compounds . . . . cwt.	581,656	377,787	131,920	98,002
Sodium Nitrate . . . ,,	22,556	46,207	8,565	22,324
Other Sodium Compounds . . . . cwt.	45,169	25,045	31,992	14,279
Tartar, Cream of . . ,,	2,733	2,199	12,062	9,848
Zinc Oxide . . . . tons	1,072	947	31,211	24,780
All Other Sorts . . . value	—	—	325,984	208,940
DRUGS, MEDICINES, ETC.—				
Quinine and Quinine Salts . . . . oz.	109,768	56,460	8,169	4,126
Bark Cinchona (Bark Peruvian, etc.) . . cwt.	1,690	4,346	7,111	18,832
Other Sorts . . . . . . value	—	—	156,676	125,745
DYES AND DYESTUFFS—				
Intermediate Coal Tar Products . . . . cwt.	47	157	700	1,672
Alizarine . . . . ,,	54	43	1,530	1,968
Indigo, Synthetic . . ,,	—	—	—	—
Other Sorts . . . . ,,	3,959	2,752	85,119	62,629
EXTRACTS FOR DYEING—				
Cutch . . . . cwt.	4,695	2,640	7,159	4,980
Other Dyeing Extracts cwt.	2,789	2,056	9,770	7,092
Indigo, Natural . . . ,,	—	—	—	—
Extracts for Tanning ,,	73,645	111,600	75,097	106,765
PAINTERS' COLOURS AND MATERIALS—				
Barytes, Ground . . . cwt.	42,421	39,088	9,015	7,707
White Lead (Dry) . . ,,	12,413	12,163	21,739	20,135
All Other Sorts . . . . ,,	107,807	125,277	141,262	139,879
Total of Chemicals, Drugs, Dyes and Colours . . . . . . value	—	—	1,261,035	1,053,461

Exports

	Quantities Month ended September 30, 1929.	Quantities Month ended September 30, 1930.	Value Month ended September 30, 1929. £	Value Month ended September 30, 1930. £
CHEMICAL MANUFACTURES AND PRODUCTS—				
Acid Sulphuric . . . . cwt.	40,890	13,905	7,691	3,671
Acid Tartaric . . . . . ,,	985	1,024	7,131	6,215
Ammonium Chloride (Muriate) . . . . tons	294	457	4,299	7,555
Ammonium Sulphate—				
To Spain and Canaries tons	10,634	21,998	94,181	154,397
,, Italy . . . . ,,	200	25	1,664	166
,, Dutch East Indies tons	150	246	1,395	1,852
,, China (including Hong Kong) tons	9,111	2,944	84,835	22,083
,, Japan . . . . . . ,,	12,246	—	110,367	—
,, British West India Islands and British Guiana . tons	411	833	3,541	6,002
,, Other Countries ,,	6,663	22,603	59,154	157,582
Total . . . . ,,	39,415	48,649	355,137	342,082
Bleaching Powder . . . . cwt.	46,041	38,876	12,756	10,801
COAL TAR PRODUCTS—				
Anthracene . . . . cwt.	—	286	—	86
Benzol and Toluol . galls.	12,550	5,429	1,374	547
Carbolic Acid . . . . . . cwt.	cwt.	1,700	25,420	3,482
Cresylic Acid . . . . . . galls.	18,346	60,664		7,777
Naphtha . . . . ,,	4,579	3,803	476	357
Naphthalene . . . . . . cwt.	3,412	5,561	1,478	1,319
Tar Oil, Creosote Oil, etc. . . . . galls.	4,107,024	1,094,439	109,078	26,426
Other Sorts . . . . cwt.	35,839	14,837	26,759	10,462
Total . . . . value	—	—	164,585	50,456
Copper, Sulphate of . . tons	464	956	12,001	20,405
Disinfectants, Insecticides, etc. . . . . cwt.	34,906	29,968	81,390	79,915
Glycerine, Crude . . . . ,,	5,654	3,378	12,120	6,622
Glycerine, Distilled . . ,,	16,448	10,751	40,445	26,315
Total . . . . ,,	22,102	14,129	52,565	32,937
POTASSIUM COMPOUNDS—				
Chromate and Bi-chromate . . . . cwt.	1,245	1,451	2,555	2,848
Nitrate (Saltpetre) . ,,	1,263	786	2,338	1,535
All Other Compounds ,,	3,111	2,960	9,900	11,983
Total . . . . ,,	5,619	5,197	14,793	16,366
SODIUM COMPOUNDS—				
Carbonate, including Soda Crystals, Soda Ash and Bi-carbonate cwt.	436,409	335,133	119,354	90,731
Caustic . . . . ,,	173,806	133,408	107,003	97,100
Chromate and Bi-chromate . . . . cwt.	2,557	1,966	3,664	2,997
Sulphate, including Salt Cake . . . . cwt.	180,649	135,349	19,717	15,335
All Other Compounds ,,	58,452	45,731	64,284	47,960
Total . . . . ,,	851,873	651,587	314,022	254,123
Zinc Oxide . . . . tons	96	234	3,697	6,868
Chemical Manufactures, etc., all Other Sorts value	—	—	296,851	231,733
Total of Chemical Manufactures and Products (other than Drugs and Dyestuffs) . . . . value	—	—	1,326,918	1,063,127
DRUGS, MEDICINES, ETC.—				
Quinine and Quinine Salts . . . . oz.	107,967	107,276	10,193	9,946
All Other Sorts . . . . value	—	—	203,264	202,074
Total . . . . ,,	—	—	213,457	212,020
DYES AND DYESTUFFS—				
Products of Coal Tar cwt.	13,797	10,980	78,134	69,699
Other Sorts . . . . . . ,,	7,537	5,308	8,793	7,842
Total . . . . ,,	21,334	16,288	86,927	77,541
PAINTERS' COLOURS AND MATERIALS—				
Barytes, Ground . . . cwt.	1,875	2,024	1,212	1,075
White Lead (Dry) . . ,,	4,276	1,932	8,678	3,734
Paints and Colours in Paste Form . . . . . cwt.	29,837	27,116	57,503	50,934
Paints and Enamels prepared (including Ready Mixed) . . . . cwt.	38,564	36,095	119,265	116,843
All other Sorts . . . . ,,	52,587	42,878	87,516	80,687
Total . . . . ,,	127,139	110,045	274,174	253,273
Total of Chemicals, Drugs, Dyes and Colours . . . . . . value	—	—	1,901,476	1,605,961

Re-exports

	Quantities Month ended September 30, 1929.	1930.	Value Month ended September 30, 1929. £	1930. £
CHEMICAL MANUFACTURES AND PRODUCTS—				
Acid Tartaric......cwt.	176	142	1,354	929
Borax............ ,,	12	81	7	49
Coal Tar Products. value	—	—	30	18
Potassium Nitrate (Saltpetre)..........cwt.	74	64	115	87
Sodium Nitrate ... ,,	411	1,036	212	527
Tartar, Cream of .. ,,	467	217	2,300	1,148
All other Sorts....value	—	—	17,720	29,954
DRUGS, MEDICINES, ETC.—				
Quinine and Quinine Salts............oz.	20,272	2,550	2,048	263
Bark Cinchona ....cwt.	332	627	2,738	6,730
All other Sorts....value	—	—	25,425	30,848
DYES AND DYESTUFFS—				
Cutch ....cwt.	1,645	1,535	2,561	2,573
All other Sorts ... ,,	74	71	1,188	550
Indigo, Natural ... ,,	3	2	55	68
Extracts for Tanning ,,	684	1,009	910	1,476
PAINTERS' COLOURS AND MATERIALS......cwt.	1,571	525	2,641	1,610
Total of Chemicals, Drugs, Dyes and Colours......value	—	—	59,550	76,883

Overseas China Clay Trade

Imports during September

THE quantities and values of china clay, including china stone, imported into Great Britain and Northern Ireland during September were :

COUNTRY WHENCE CONSIGNED.	QUANTITY. Tons.	VALUE. £
Germany	—	2
U.S. America	27	120
	27	122

Exports

EXPORTS of clay—china clay, including Cornish or china stone—the produce of Great Britain and Northern Ireland, during the month were as follows :—

	Tons.	£
Finland	354	570
Sweden	2,594	5,765
Denmark (including Faröe Islands)	919	2,687
Germany	3,120	6,666
Netherlands	2,759	5,416
Belgium	3,150	5,564
France	3,277	6,356
Switzerland	20	65
Spain	758	2,200
Italy	3,034	6,387
Greece	31	116
Egypt	41	166
China	5	27
Japan	20	237
United States of America	20,789	43,838
Cuba	20	35
Brazil	3	13
Irish Free State	7	17
Union of South Africa	3	43
British India	222	976
Bengal, Assam, Bihar and Orissa	120	469
Hong Kong	—	4
Australia	25	124
New Zealand	8	47
Canada	71	709
	41,350	88,497

Activities of the Government Laboratory

Further Extracts from Annual Report

THE following are further notes from the report of the Government Chemist on the work of the Government Laboratory during the year ended March 31 last, from which a lengthy extract appeared in our last issue :

The total number of samples examined in the year in connection with the duty on beer was 59,672, being an increase of 3,436 samples. The number of samples tested, including beer, wort, malt, sugar and other materials used in brewing, was 1,546. Of these 32 were found to contain arsenic in slight excess of the limit laid down by the Royal Commission on Arsenical Poisoning, namely, the equivalent of one-hundredth of a grain of arsenious oxide per pound in the case of solids, or per gallon in the case of liquids.

Fifty samples of beer, concealed wort, sugar solutions, etc., were examined in view of irregularities discovered or suspected (including the illegal addition of sugar, and brewing by unlicensed persons) and in respect of other inquiries. Eighty-five samples of beer were examined specially for saccharin, but in no case was this prohibited ingredient present.

Under the Hydrocarbon Oils Duty the total number of samples examined was 10,342, of which 7,840 were from imported and 2,502 from exported goods. Of these 4,523 consisted of hydrocarbon oils and 5,819 were miscellaneous composite goods such as enamels, lacquers, leather colours, paints, varnishes, garage preparations, road dressings, solvents, insecticides, medicinal and toilet preparations, essential oils, etc.

Examination of Fertilisers

During the year three fertilisers and fourteen feeding stuffs were examined, one being examined at the request of the seller. The fertilisers consisted of two fertilisers, sold in packets, and a bone meal, all deficient in phosphoric acid. The proportions of fertilising ingredients in the two packet fertilisers were exceedingly low, and were comparable with those found in garden soil. The feeding stuffs included barley meal, meat meal, meat and bone meal, laying meal and a mixed wheat, oat and barley meal. Three samples of barley meal were found to contain 15 per cent. of oats in addition to weed seeds and sand. Three samples of meat and bone meal were found to be deficient in phosphoric acid, and one was adulterated with potato. Two samples of meat meal were deficient in protein, and in one of the samples 6 per cent. of potato and 11 per cent. of sand were found. Four samples of laying meal were deficient in oil, and a wheat, oat and barley meal was found to contain about 8 per cent. of oat shudes.

A sample of honey was found to be adulterated with a large proportion of artificially prepared invert sugar. Two samples of cod-liver oil for cattle-feeding were found to be grossly adulterated, one consisting of a mixture of cod-liver oil and 60 per cent. of sperm oil, and the other consisting entirely of fish body oil.

Four samples of lime and sulphur insecticides were analysed, and from the results obtained in these and former samples, the relationships between the various suggested criteria of strength of these products, namely, the specific gravity, total sulphur content, and polysulphide sulphur content, have been worked out.

A sample of soap alleged to be made wholly from waste potatoes was examined and found to consist of ordinary soap loaded with sodium carbonate and starch, presumably derived from potatoes.

Work for Air Ministry

The work for the Department for the Air Ministry consisted chiefly in the examination of various metals and alloys used in aircraft construction, but included soldering fluxes and miscellaneous stores, such as soap, disinfectants, fuel oils, gold ace, glass, carbide, oil of vitriol, chemicals and materials used in the preparation of explosives and smoke bombs, creosotes, and vegetable fibres. Two samples of natural gas from South Africa were found to contain only negligible traces of helium. The number of samples dealt with was 245.

Lord Melchett Indisposed

LORD MELCHETT is suffering from a mild attack of phlebitis, and will be confined to his house for at least three weeks.

The Chemist and the Craftsman

Presidential Address to Oil and Colour Chemists' Association

The true relationship between the chemist and the craftsman formed the burden of the Presidential Address of Mr. Noel Heaton at the first meeting of the Session of the Oil and Colour Chemists' Association, held at the Mecca Café, Chancery Lane, London, on Thursday, October 9.

At the outset of the meeting a bound volume of the *Proceedings* of the Association during his term of office was presented to Dr. J. J. Fox, the retiring president, and a gold cigarette case to Mr. S. G. Clifford, the retiring honorary treasurer, as a memento and in appreciation of the work he has done in looking after the finances of the association during the past seven years. It was mentioned by Dr. H. H. Morgan, in making the presentation, that when Mr. Clifford first took over the honorary treasurership of the association the membership was 180, whereas to-day it was 400, and that the total income of the association had increased during the same period from £182 to £800, a deficit of between £70 and £80 having been turned into a credit balance last year of about £100.

Combination of Ideals

Mr. Noel Heaton then delivered his presidential address, in the course of which he reviewed the aims and possibilities of the association and its relation to the group of industries with which it is associated. He recalled the formation of the Paint and Varnish Society in 1905, and the later formation in 1918 of the Oil and Colour Chemists Association, the idea of which was to have an association limited to trained chemists connected with the industry. It was found, however, that the functions of the two organisations so overlapped that amalgamation was inevitable, and there was a fusion of the two. Mr. Noel Heaton said he recalled these facts because the real purpose of his address was the theme that whilst the original Paint and Varnish Society is dead in name, its spirit is embodied in the association, and that for the Oil and Colour Chemists Association to be a real vital force it must combine both the ideals which brought the Paint and Varnish Society and the Association into existence—viz., to bring the man with scientific training and the practical man, the chemist and the craftsman, together, and to provide a means for chemists as such to meet together.

He had never made a secret of the fact, continued the president, that the title of the association, even before the amalgamation, was a mistake even from the purely academic point of view. How often had it been pointed out that pure chemistry was only part of the work of the average oil and colour chemist, a part that became less paramount every day. Chemical analysis alone, without the aid of physics and microscopy, for example, would scarcely enable us to judge the practical value of a pigment to the paint maker, the printing ink maker or any other branch of the industries concerned. The petroleum and the glass industries were more consistent in substituting the word "technology" for "chemistry" in the titles of their organisations.

Further, since the amalgamation of the two societies the title of the association has been misleading, in that it tended to convey the impression that it was a close corporation of none but chemists. He knew that impression had been formed in many quarters, and it had deterred some from joining the association whose co-operation would be valuable. He did not suggest, however, that at this stage the title of the association should be changed by dropping the word "chemist," much as he would like it, but wished to stress the point that its name did not justly describe its activities.

The First Synthetic Pigment

History had shown the need for this co-operation and mutual help and understanding. Before the days of science the knowledge of the craftsman was purely empirical, but his work was magnificent in conception and execution. One example of what craftsmanship achieved unaided by science would suffice. The first synthetic pigment ever produced was called Egyptian Blue, and it was made in Egypt about 3000 B.C. Modern investigation showed that it was a definite crystalline silicate of copper. It was made by the calcination of the raw material, and could be properly developed if the temperature was carefully regulated and kept constant within a few degrees for a definite period. This pigment was made in large quantities and exported all over the then known world. How did the early workers discover how to make it in the first place and manage to work the process successfully without any technical knowledge, and with only the most primitive appliances? It was by the same process that the varnish maker of the old school developed the making of varnish into a fine art; by laboriously gained experience, shrewd and untiring observation and abundant common sense. It was a mistake to underrate the value of this empirical knowledge, but it was equally a mistake to overrate it. Experience gained by an unguided process of trial and error took years to attain perfection, and when perfection was attained the reason for it was not evident, so that continued success was only maintained by slavish following of tradition. Moreover, the knowledge was often wrapped up in mystery, and could not be recorded. The craftsman, as a rule, could not say, why he did a certain thing in a certain way; he only knew that things went wrong if he did not. Such experience could only be gained by tradition, and if there were any break in the tradition the process was lost. That happened in the case of ruby glass in the sixteenth century, when, owing to war or pestilence, experience gained since the twelfth century was lost through death, and it was sought in vain for the next 200 years to make such beautiful ruby glass. It was here, surely, that the value of co-operation between the chemist and the craftsman came in. The function of the chemist—or the technologist—was to provide a clear explanation of the processes worked out blindly by the traditional method, to reduce empirical observations to order and system, and sift the essential from the accidental and by so doing cut out uncertainty and waste. In the case of the Egyptian blue, this took at least a century to perfect, whereas, given the initial observation, modern science would standardise its production in a few weeks.

The Craftsmen's Intuition

It might be argued from this that the chemist could supersede the craftsman entirely, but Mr. Noel Heaton contended emphatically that that was untrue. The craftsman gained by experience a consummate knowledge of the materials he handled and the chemist interpreted that experience and reduced it to system. For instance, mysterious defects often cropped up in a process and baffled investigation on purely scientific lines because the field of inquiry was so vast that there was no clue to work on. The craftsman type of mind would often hit on the clue, accidentally perhaps, but by a sort of intuition. Provided with this clue, the technical man could then work it out on scientific lines. That was why both types were needed in applied, as distinct from pure, science. The work of one supplemented the work of the other, and both were wanted in the association.

Finally, Mr. Noel Heaton spoke with regard to the necessity for the chemist to learn the art of clear expression when speaking to those who were not so technically trained. It was necessary, of course, that a technical jargon should be used among chemists, but the use of scientific nomenclature could be overdone. It was little use gaining infinite knowledge if it were not made available by interpreting it to other branches of industry. It was the function of the association to act as interpreters between the pure scientist and the craftsman, and the applied chemist who could not express himself without the excessive use of technical terms was a bad chemist.

Silesian Coal Tar Production

Coal tar production in Upper Silesia—Germany's second most important domestic source of these products—during the first half of 1930 totalled 30,930 metric tons. The output of other coal-distillation products during the same period was: Tar pitch and tar oil, 478 metric tons; crude benzol and its homologues, 11,586 metric tons; ammonium-sulphate, 10,757 metric tons; crude naphthalene, 35 metric tons.

Formation and Properties of Boiler Scale.—(III)

By Dr. Everett P. Partridge

An important investigation of the problem of Formation and Properties of Boiler Scale, by Dr. E. P. Partridge, has been published by the Department of Engineering Research of the University of Michigan (Pp. 170, price one dollar). The following extracts taken from the Bulletin (Engineering Research Bulletin No. 15, June, 1930) give some idea of the comprehensive treatment of the subject. The earlier instalments appeared in our issues of September 20 and October 4.

THE use of soda ash for the internal treatment of boilers is far from new, but definite control of this type of treatment is relatively recent. Badger, in 1916, described an empirical method, worked out in conjunction with The Detroit Edison Company, by which soda ash was fed continuously by an automatic proportioning device. The rate of feed was adjusted by determination of the carbonate alkalinity and the total dissolved solids in the boiler blow-off water, the former being determined by titration and the latter by a conductivity tester. Certain limits of the ratio of these two quantities were found by experiment to define a boiler-water condition which prevented the formation of calcium sulphate scale.

While Badger's work was purely empirical, Hall, in 1925, defined internal conditioning with soda ash upon a relatively definite theoretical physico-chemical basis. The principle of the system developed by Hall is the maintenance of a definite chemical equilibrium in the boiler water such that the solid phase deposited shall not form a rapidly growing scale. Since calcium sulphate is the most frequent and in general the most objectionable constituent of scale, while calcium carbonate scales grow only at a very slow rate, it is desirable to adjust the equilibrium in the boiler water so that calcium carbonate rather than calcium sulphate will always be precipitated on evaporation. This is accomplished by adding soda ash directly to the boiler in amounts sufficient to maintain a definite ratio of carbonate to sulphate in the boiler water.

Treatment with Phosphate

Soda ash, unfortunately, hydrolyses rather rapidly at boiler temperatures liberating carbon dioxide which passes off in the steam, and leaving residual caustic soda in the boiler water. As the boiler pressure is increased, the rate of hydrolysis increases and Hall's ratio of carbonate to sulphate conflicts with the sulphate-alkalinity ratio proposed for the inhibition of "caustic embrittlement." For this condition, Hall advocates the substitution of one of the sodium salts of phosphoric acid for soda ash in amounts sufficient to maintain a definite phosphate-sulphate ratio.

While this type of treatment is eminently satisfactory, the cost of treatment with phosphate is generally higher than that of treatment with soda ash. Since calcium ion entering the boiler is precipitated almost quantitatively as tri-calcium phosphate, it is manifestly uneconomical to use internal conditioning with phosphate on a boiler fed with a raw water containing any appreciable amounts of dissolved calcium salts. In such a case some type of external softening combined with internal phosphate conditioning is indicated.

It is probably, as suggested, that the ratios defined by Hall allow a large factor of safety and that the establishment of closer values will indicate a variation in the ratios with variation in the ionic concentration of the boiler water. There is some possibility that the requisite value of the carbonate-sulphate ratio may be re-defined to allow a more general use of soda ash for internal treatment than is considered good practice at present. Some general study of the rate of hydrolysis of sodium carbonate in boilers is greatly needed at the present time to allow the establishment of optimum methods of maintaining the necessary concentration of carbonate ion during internal treatment with soda ash.

The economic factors involved in the choice of a system of scale prevention must be evaluated for each individual problem, and cannot be treated here. It is, however, possible to summarise the fields of application of the various systems.

Internal treatment with organic colloids may have some possibilities for use in boilers not driven at high ratings or under high pressure. No reputable engineer, however, will allow the use of a boiler compound or colloid treatment the composition of which is not known to him. Electrical systems for the prevention of scale are not well based theoretically and they have not yet been demonstrated on a satisfactory practical basis. An impartial investigation of both colloid and electrical methods of scale prevention is recommended.

Where the most severe demands are made upon a boiler installation, the choice will probably lie between the distillation of make-up water, a zeolite softening system, or the combination of external hot-process lime-soda softening with internal phosphate conditioning. For less exacting service the lime-barium softening system is approximately on a par with the hot-process lime-soda system. Where conditions permit, internal conditioning with carbonate will probably always have a very general application.

General Summary of Conclusions

The safe and efficient operation of boilers at the high ratings customary at the present time requires the complete prevention of boiler scale. Scale is a heat-insulating material, and, contrary to common impression, porous scales are poorer conductors of heat than dense scales. A very slight deposit of even a hard dense scale may, however, cause the overheating and failure of boiler tubes exposed to direct radiation. This overheating of boiler metal is the most serious effect of scale; its effect on overall boiler efficiency is much less than the figures commonly quoted.

The chief chemical constituents of boiler scale are calcium sulphate, calcium carbonate, magnesium hydroxide and calcium and magnesium silicates. Calcium hydroxide is occasionally found as a major constituent, and various other substances are also found in scales formed under unusual conditions. All of the chief constituents of scale are very slightly soluble in water at boiler temperatures, and all of them are believed to become less soluble with increase in temperature. It has been shown by direct measurement that calcium sulphate, calcium hydroxide, and magnesium hydroxide all decrease in solubility as the temperature is raised in the boiler range. The solubility of calcium carbonate is dependent upon the concentration of carbon dioxide in the atmosphere in contact with the solution, but it has been shown at lower temperatures that, for a constant partial pressure of carbon dioxide, the solubility of calcium carbonate also decreases with temperature increase. While there are no definite data for the calcium and magnesium silicates, it is believed that they show the same property of negative solubility slopes.

Sludge and scale formed in a boiler must be in approximate chemical equilibrium with the complex solution represented by the boiler water. In dealing with solubility equilibria in these complex solutions it is probably preferable to make calculations from the viewpoint of activities rather than attempting to use data for ionization of the respective substances in their respective simple solutions in pure water.

Deposition of Boiler Scale

Boiler scale may conceivably be deposited in three ways: by the settling out and subsequent cementing on the boiler surfaces of articles suspended in the water; by spontaneous crystallisation of salts from supersaturated boiler water, the action taking place chiefly at the heating surface of the boiler because of the greater degree of supersaturation caused by decreased solubility of scale constituents at the slightly elevated temperature in the fluid film adjacent to these surfaces; and by the action of bubble evolution at an evaporative surface, the scale crystals being deposited in rings formed by the line of contact of the bubbles with the dry surface beneath them and the solution around them. The first type of scale formation may actually take place in an intermittently operated horizontal return tubular or marine boiler, but is certainly not responsible for the formation of scale in the tubes of water-tube boilers. Here the third type of action undoubtedly occurs. The deposition of scale on surfaces at which evaporation is not occurring must be due to a mechanism of the second type described.

The rate of scale formation in a boiler is probably not a function of the actual solubility of the scaling substances,

but rather of their rate of decrease in solubility with increase in temperature. The other controlling factor is the rate of heat transfer across the surface on which the scale is growing, while the velocity of the boiler water may have a slight influence.

Need for Further Research on Scale Problems

The prevention of scale depends upon either extremely complete softening of feed water, or careful control of the chemical equilibria in the boiler water to precipitate as solid material a substance which will form scale only with extreme slowness, if at all. For external softening, the hot-process lime-soda, lime-barium, and either lime-zeolite or zeolite-acid systems are the most important at the present time. Internal conditioning with soda ash is limited to lower pressures because of the high alkalinity developed in the boiler water by hydrolysis of carbonate, but phosphate conditioning is applicable at any pressure, particularly when used in conjunction with some type of external softening treatment. While colloids undoubtedly exert an influence on the physical properties of scale, reliance should not be placed on their use for scale prevention in boilers where slight scaling might cause failure. Electrical systems of scale prevention apparently have little actual value.

Boiler scale is not a problem which has been satisfactorily ol ved once and for all. The development of boiler design is constantly rendering inadequate the means previously taken to obviate the occurrence of scale. Continued research is a very definite necessity. At present there are several lines of investigation which should be started without delay. One of these is a study of the silicate compounds formed in boiler scale, with a determination of the solubility equilibria of these substances in boiler waters at high temperatures, and an investigation of the available means for their certain prevention. Another problem of prime importance is a general study of solubility equilibria in boiler waters at temperatures up to the critical temperature.

It is probable that for many years to come the majority of smaller boiler installations will operate at only moderate pressures. For the benefit of engineers in this field, comprehensive studies should be made of the controlling factors in the hydrolysis of carbonates, and of the effects which organic colloids do or do not produce in the inhibition of scale growth. It would also be extremely valuable to have a comprehensive engineering report on the various proposed systems of scale prevention by electrical means.

Steam seems destined to remain one of the chief means of energy transfer for an indefinitely long future. The generation of steam, however, must always involve, at some point, the use of impure natural waters. When steam is no longer generated, boiler scale problems will have been finally solved.

Concluded.)

The Influence of Chemistry on Medicine

By Dr. Hans Thacher Clarke

The important rôle which modern organic chemistry is playing in the development of the science of medicine are dealt with in the following address delivered by Dr. Clarke at the opening exercises of the 1930–31 Academic year of the Medical School of Columbia University, where he is Professor of Biological Chemistry.

A QUESTION frequently asked by medical students of their instructors in biochemistry is, "What is the relation of all this to medicine ?" It is a question which stimulates an attitude of mental stocktaking in the instructor, and on this occasion it seems proper to discuss a few of the points common to both chemistry and medicine which have most impressed one organic chemist during the two years since he came, as an entire outsider, into contact with medical processes of thought.

The development of synthetic organic chemistry during the past hundred years has brought chemistry into increasingly close contact with medicine. The most spectacular contributions of organic chemistry lie in the domain of chemotherapy, but, apart from this, chemistry is playing other important rôles in the development of the science of medicine. During the last quarter-century a new weapon has been placed in the hands of the physician by the development of a microchemical technique, by means of which confirmatory evidence supporting clinical diagnosis is supplied by the quantitative estimation of specific components of the blood. This technique has now taken root so firmly in the practice of medicine that fear has been expressed, in certain quarters, of the danger that the classical methods of diagnosis may be unjustly neglected.

Hormones, Vitamins and Enzymes

The feature in the medical and biological aspects of chemistry which is perhaps the most striking is the widespread effect on the living tissue of minute traces of chemical substances. This subject is all the more intriguing to the chemist by reason, on the one hand, of his profound ignorance of the chemical nature of most of these substances, and, on the other, by the diversity in the chemical character of those regarding which he has been able to secure evidence. These substances are the hormones, the vitamins, and the enzymes.

Twenty-eight years ago Bayliss and Starling secured evidence that the flow of pancreatic juice is stimulated, not by nerve impulses, but by a substance introduced into the blood stream whenever food passes from the stomach into the duodenum. This substance, which was found to be secreted by the duodenal mucous membrane and could to a considerable degree be separated from materials accompanying it in the blood, was termed "secretin"; and since it appeared to be a representative of a numerous class of similar agents, these were designated by the general term "hormone," meaning an excitant, or colloquially, a walking delegate. It was soon shown that the amounts of hormones necessary for physiological response were of the order of those of radioactive elements detectable by the electroscope, or of odorous substances noticeable by the sense of smell.

While the chemical nature of secretin awaits elucidation, at least one other hormone has yielded to chemical investigation and has proved to be a relatively simple organic compound. This is epinephrine, a secretion of the adrenal gland, which controls the constriction and dilatation of the blood vessels. Its synthesis from components of coal tar has been effected without especial difficulty. The majority, however, appear more complicated. The regulation of the metabolic rate depends upon the secretion of the thyroid gland ; thyroxin, a crystalline organic compound containing more than 50 per cent. iodine, has been isolated from the hydrolytic products of this gland and its constitution has been established both by analysis and by synthesis. Thyroxin produces, upon administration, a rise in basal metabolic rate comparable to that observed with the globulin of the thyroid, which contains thyroxin in combination.

Less clear, from a chemical standpoint, is the case of insulin, the hormone which regulates the metabolism of sugar. This has now also been obtained in an apparently pure condition ; it appears to be a typical protein, lacking any characteristic or unusual grouping such as that which distinguishes the physiologically potent protein of the thyroid.

Although the chemical nature of most of these hormones awaits solution, the clinical importance of some of them is rapidly increasing. To judge by the success of synthetic chemical methods in the preparation of analogues and substitutes for naturally occurring compounds of pharmacological importance, chemists can look forward to the development of many fruitful fields in the realm of synthetic hormones, when once the initial exploration of this territory is sufficiently far advanced.

Vitamins

Nutrition likewise offers many possibilities for chemistry. Here again we are confronted with the influence of minute amounts of chemical substances, a deficiency of which in the diet is responsible for specific ailments. These substances, the vitamins, resemble the hormones in their necessity to the maintenance of health and in the fact that their effect is obviously associated with the presence of living tissue. They

differ from the hormones in that they are, for the most part, of external origin. At the present time, the existence of six vitamins has been demonstrated and that of a seventh is indicated, but of all of these there is only one regarding the constitution of which we possess more than a few hints. This exception is the antirachitic vitamin D, now known to be a closely related isomer of the triply unsaturated alcohol ergosterol, from which it is formed by the action of light of the near ultra-violet region.* But even in this case the chemical constitution has not been established with certainty.

Enzymes

Equally obscure is the composition of the enzymes. In one respect the chemistry of this group should be simpler than that of the hormones and vitamins, since enzymes promote changes in purely chemical systems, without the intervention of living tissue. Much is already known with regard to enzymatic specificity and the kinetics of reactions stimulated by enzymes; how they act can be explained only when their chemical constitution is understood. Urease, the enzyme which brings about the hydrolysis of urea into ammonium carbonate, has recently been obtained in a crystalline and apparently pure condition, but as yet all that can be said about its make-up is that, like insulin, it appears to resemble nothing so much as a protein.

It is too early even to speculate upon the mechanism of hormone and vitamin action, since we know far too little about the chemical nature of the tissues which co-operate. On the other hand, we have good reason for believing that an enzyme acts by first forming a labile addition product with the material upon which it acts, and it is this chemically active addition product which undergoes the enzymatically induced chemical change. A close parallel to this type of action is found in the behaviour of inorganic catalysts. According to views recently developed by physical chemists, the molecules of any substances are not, as was previously imagined, all alike: individuals will differ, in an intermittent manner, in their free energy content, much as fireflies periodically emit light.

Such changes are considered to be due to the temporary shifting of an electron in an atom to an outer orbit. Under conditions in which a relatively slow chemical change takes place (as, for instance, when mixtures of a hydrocarbon and oxygen are maintained at a temperature below that at which ignition occurs) such a change is undergone by molecules only in their higher states of activity. In the presence of a catalyst these "hot" molecules combine with the catalyst at lower energy levels than those necessary for unassisted reaction, yielding additive compounds which more readily undergo chemical changes.

Anti-Catalysts

An analogous theory has been put forward to explain the behaviour of anti-catalysts, a less spectacular but equally interesting class of substances which inhibit, rather than excite, reactions. These likewise combine with the more highly active molecules to form additive compounds. In this case, however, the loose double compound displays no tendency to react with a third substance, but disassociates into its original components as soon as the energy of the superexcited molecule subsides. We have as yet no clear conception of the fundamental contrast in these two types of additive compound, but it may well be that the balanced action of hormones exerting opposed effects in our bodies is based upon some analogous process.

The explanation will be long in coming, since it will unquestionably involve the chemistry of the proteins, concerning which our fundamental knowledge is still extremely tenuous. The many recent investigations of the nature of proteins have served to bring uncertainty rather than certainty into our views of their constitution. This, however, is not necessarily a discouraging situation, since practically every branch of science has at some time passed through a similar state. A more serious obstacle to the ultimate attainment of an exact knowledge of the natural proteins is the overwhelming number of combinations which it is possible for the score of known constituent amino-acids to form. Abderhalden has calculated that not less than $2{\cdot}4 \times 10^{18}$ (that is, more than two million million million) different compounds may theoretically be formed by the combination of twenty amino-acids, each taken once. And when it is considered that these components can also occur more than once in each resultant compound, it will be realised that the number of possible protein structures reaches truly astronomical proportions.

World Trade in Glycerine

British Markets in Canada and the Far East

WORLD trade in glycerine is reviewed in the course of an article in *Commerce Reports*, which indicates the importance of the Far Eastern market for the British product, half of our exports in 1928 going to China and Japan. Britain also has the major share of the Canadian glycerine trade, the chief percentage participation in Canadian imports in 1929 being as follows: Dynamite glycerine—the Netherlands, 39; the United Kingdom, 31; Germany, 22; all other glycerine—the United Kingdom, 59; the Netherlands, 20; United States, 14.

Although glycerine consumption in the United States has more than doubled during the past decade, domestic production has advanced at even a faster rate. In 1920 the home output supplied 67 per cent. of the domestic requirements of crude glycerine and 93 per cent. of the consumption of the refined, whereas, at the present time, demand in the United States is dependent on domestic production to the extent of 94 per cent. of the crude and 96 per cent. of the refined that is consumed.

Most of the Latin-American countries have extensive mining enterprises which require large amounts of explosives, a very small proportion of which is furnished by domestic manufacture. The bulk of their supplies is obtained from the United States, the largest purchaser being Chile.

In 1927, the latest year for which French statistics are available, the United States received nearly half of the French export of crude glycerine, which amounted to 10,000,000 pounds. The importance of the United States as an outlet for French crude glycerine is demonstrated by the rise in French exports from 8,500,000 pounds in 1928 to 10,000,000 in 1929, coincident with the increase in United States imports of the crude from France, from 1,638,176 pounds in 1928 to 4,931,691 in 1929.

Exports of France and the Netherlands

In 1929 the United States was a leading market for refined glycerine from the Netherlands, but the radical drop in United States imports during the first half of 1930 caused the Netherlands to divert a larger proportion of its exports to other outlets. Coincidentally, during the first half of 1930, outgoing shipments of refined glycerine—of which the bulk of the Netherlands export of glycerine consists—registered a decline to 5,298,000 pounds from the 7,174,000 exported during the corresponding period of 1929. The United States is not an important market for British refined glycerine, exports of which amount to about 14,500,000 pounds a year, but substantial quantities of the refined product are imported from Germany.

Mason College, Birmingham

Honorary Degrees Conferred at Jubilee Celebration

THE jubilee of Mason Science College, of which the University of Birmingham is the outgrowth, was fittingly celebrated on Monday. Twelve honorary LL.D. degrees were conferred, the recipients being presented to the Chancellor (Viscount Cecil of Chelwood) by the Vice-Chancellor and Principal (Sir Charles Grant Robertson). Among them were:—

Sir William Hardy, who, Sir Charles recalled, was Chief Director of Food Research, and as a physicist, physiologist, chemist and a great biologist, was a pioneer in the science of life;

Professor Robert Robinson, recently chosen by the University of Oxford to be the successor of that distinguished scientist, Professor Sir William Perkin—a choice that corroborated the judgment of his brother chemists that in the sphere of organic chemistry he was their acknowledged leader; and

Dr. F. E. Smith, secretary of the Royal Society. He had put both the true physicist and the amateur deeply in his debt, not merely as an experimentalist of the highest order, but by his original work on the fundamental units of measurement in electricity and magnetism. He was the first Director of the Department of Electro-Magnetism at the National Physical L aoratory.

Indian Chemical Notes

(From Our Indian Correspondent.)

Soil and Sulphur

From the data derived from numerous South Indian tea estates, it has long been evident that many of the soils of the tea estates of South India have not the right proportion of acid, and consequently an inquiry into the effect of sulphur on the degree of acidity became desirable. A sulphur experiment was, therefore, started in October, 1929. The area was divided into 35 sub-plots of as nearly equal size as could conveniently be done, and the pH value representative of each of these was determined. The method used for the determination of the pH values has in every case been electrometric, using quinhydrone and a standard cell containing a mixture of hydrochloric acid and potassium chloride with a pH 2·04. The apparatus and method were very fully tested before being applied to this work, and a special technique developed to enable the estimation to be done with the maximum accuracy and dispatch.

Results Obtained

From the very commencement of the experiment there has been a steady fall in the pH of the check plots, and this can only be attributed to the effect of the drying out of the soil and possibly the rise in soil temperatures. This change has been of sufficient magnitude to indicate that an isolated determination of the pH value of a soil is not sufficient by itself to classify the soil. The time of the year at which the sample was taken and the climatic influences preceding this were also taken into account. It appears that soils under mature tea would not suffer such a large change in reaction during the dry weather.

Manuring and Diseases

In addition to the estimation of acidities required by the sulphur experiments, a number of soils received from various estates have been examined chiefly in the interests of manuring and also partly in relation to disease. In relation to diseases, sufficient evidence has not yet been accumulated, but in manuring it is already obvious that full information on the reaction of soils to manures is essential before a scientifically sound manuring programme can be drawn up. Especially where heavy manuring is carried out, care should be taken that any influence which these manures have on the soil reaction is in the right direction. Otherwise the detrimental effect on the degree of acidity will counteract an appreciable percentage of the value of the manure.

Tea Tannin

Laboratory investigations have been carried out in the plantation districts of the south, on the tannin components of green leaf tea and "made tea." On analogy with tannins derived from other material production, the name "theotannin" has been given to green leaf tannin. The results of these investigations have been collected and are in course of publication. The publication describes a new method for its preparation, a thorough investigation of the methods at present employed on tea experimental stations for estimating "theotannin," their discrepancies and suggestions for overcoming these. A new method of estimating theotannin is given, superior in accuracy and ease of working to other methods, and finally suggestions with regard to a peculiarity in the constitution of theotannin, which will be of great value in considering the changes in theotannin during withering, fermentation, and firing.

Bengal Drug Trade

The total imports into Bengal of drugs, medicines and chemicals in the year 1929–30 showed a steady increase from Rs. 172 lakhs to Rs. 193 lakhs, of which drugs and medicines were valued at 78 lakhs and chemicals at 115 lakhs. The United Kingdom still continues to be the chief supplier. Improvement was noticed in all kinds except camphor and disinfectant. It appears that buyers are turning their attention to synthetic camphor from Germany. Calcium carbide and sulphur have both shown increases, Norway maintaining the premier position in the former trade. Quinine salts improved, but there was a total falling off in the import of cinchona bark on Government account.

Research in the Aluminium Industry

Address by Dr. Richard Seligman

Dr. Richard Seligman, president of the Institute of Metals, and Mr. Murray Morrison, of the British Aluminium Co., were the speakers at the opening meeting in Glasgow last week of the Scottish local section of the Institute, and dealt with the growth of the aluminium industry.

Dr. Seligman spoke first of what the aluminium industry had done for the Institute of Metals, and later he sketched what the Institute had done for the industry. Through their contact with each other, he said, both had advanced from strength to strength. So far as material help was concerned there had never been a time when the Institute lacked aid from the aluminium industry. He claimed that to-day there had been more devoted and more practical metallurgical research devoted to aluminium than there had been to any other industry. Moreover, the results of those researches had not only been of incalculable value to the aluminium industry, but they had spread to other metals and other branches of the industry in a way they would never have believed possible.

The Lochaber Works

Mr. Morrison recalled the growth of the British Aluminium Co. step by step until the inauguration of the Lochaber hydro-electric power scheme. Giving some details of this scheme, Mr. Morrison said at the moment they had spent roughly about two-thirds of the total expenditure which would be necessary. The great 15-miles-long tunnel had been completed, as had railways and piers and other works, and he hoped in the not too distant future to proceed with the remainder of the works. Their Parliamentary powers expired next year, but they had received an extension of a further eight years to carry out the scheme. After speaking of the vast increase in the consumption of aluminium which had taken place in the last 35 years, Mr. Morrison said that when the company was founded its capital was £300,000. The assets of the company and its subsidiary concerns at the end of last year amounted to just over ten millions sterling.

"Science in Everyday Life"

A series of popular displays and demonstrations, illustrating "Science in Everyday Life," is to be given at the Portland Hall, Regent Street, Polytechnic, in aid of King Edward's Hospital Fund for London. The first of these will take place on Wednesday, October 29, when Dr. Walter Clark, Director of Research Laboratories, Kodak, Ltd., will give a demonstration-lecture on "A Hundred Years of Photography," tracing the development of photography, by description and demonstration, from the Daguerrotype down to modern processes, including X-ray photography, colour photography, and cinematography. Later demonstarions will deal with the story of Sound-production (the gramophone, etc.), Sound-photography (the talking film), Illumination and Dyeing. For full particulars and prices of tickets applications should be made to the Secretary, King Edward's Hospital Fund for London, 7, Walbrook, E.C.4.

Operation on Lord Brotherton

An operation was performed on Thursday, on Lord Brotherton, who is seriously ill at his home, Kirkham Abbey, Yorkshire. A bulletin issued during the afternoon announced that the operation was one of emergency and was well borne, but Lord Brotherton's condition gives rise to great anxiety.

Over-Production of Benzol in Belgium

There is an over-production of benzol in Belgium at the present time, with consequent low market quotations, according to the U.S. Acting Commercial Attaché in Brussels. This is largely in consequence of the higher import duty (10 marks per 100 kilos) on the product that went into effect on April 18 in Germany, which was formerly Belgium's largest market. It is reported that benzol is being delivered from Belgium to the German frontier for as low as 30 German marks per 100 litres.

Cotton Industry Research Association

Work of the Year

THE eleventh annual meeting of the British Cotton Industry Research Association was held at Manchester on Wednesday. Mr. F. Nuttall (chairman of the Council), proposing the acceptance of the annual report, said they expected great things from scientific research, and believed that much of the work that had been laboriously carried out was ready to bear fruit.

"It is only too well known that our industry is suffering, and suffering badly, from the long-continued depression," he continued. "I have even heard pessimists say that the cotton trade is finished. This is absurd, and I for one do not believe it, but what we in Lancashire are apt to forget is that the depression is world-wide, and we are passing through a phase from which we must ultimately emerge. Our share of the future prosperity will depend upon initiative and work—qualities in which Lancashire has not been deficient in the past. May I remind you in this connection that no other country has produced anything that can compare with the Shirley Institute, and that the benefits which accrue are available, first of all, to members. I am convinced that when these distressful times are a thing of the past, and the influence of this Association can be assessed, you and others will pay full tribute to the wisdom of those who inaugurated it. Meanwhile, you, as members of this great research association, can, if you will, obtain advice and help which will materially aid your own efforts. The staff of the Shirley Institute are your willing servants, and they may be able to help you solve practical everyday difficulties far more than you imagine. I invite you to take advantage of the work they are doing for you, and I am confident that if you do so you will agree that expenditure on research is the last item which you can afford to cut down."

Need for Financial Support

Their future depended to a large extent on the application of science to the various processes of the industry, and it was for them to make sure that the work of the Shirley Institute was not stunted or curtailed by lack of adequate financial support. He expressed the association's appreciation of the grant of £1,000 a year from the Empire Cotton Growing Corporation and the gift of £1,500 in books for the library from the Carnegie United Kingdom Trustees.

Dr. R. H. Pickard, director of research, said that research work in the past year had been well maintained, and they had averaged nearly four inquiries a day and, in the majority of cases, people did not inquire at the Shirley Institute on points they could possibly answer themselves. All these inquiries had meant dealing with well over 1,000 samples, coming from 426 firms. It was an interesting fact that of these inquiries 40 per cent. came from spinners and 34 per cent. from manufacturers, and he felt these figures showed that there was no bias on the chemical side of their research work. After referring to the work of the new technological liaison department, which had made more than 1,000 visits to mills, Dr. Pickard spoke of the success of their six-weekly bulletin, the recent production of a glossary and index to their ten years' work, and his belief in the need of vertical organisation in the sense of vertical knowledge. The industry had suffered from a too sectionalised knowledge.

The report and balance-sheet were accepted and Sir Kenneth D. Stewart and Mr. John Henry Strong were elected members of the council.

New Zealand's Fertiliser Imports

A MARKED feature of the importations of fertilisers into New Zealand during the year ended March 31, 1930, is the great increase in receipts of Tunisian and Moroccan phosphates. The following table shows the total importations for the past two years, for the more important varieties:

	1928–29 Long tons	1929–30 Long tons
Bonedust and bone char	554	1,420
Basic slag	99,222	94,332
Superphosphate	1,037	525
Pacific phosphate	177,057	170,997
Egyptian phosphate	6,000	300
Moroccan phosphate	22,173	35,348
Tunisian phosphate	12,499	37,424
Sulphate of ammonia	2,268	11,015

Sterilisation of Cooling Water

Use of Chlorine Gas for Condenser Systems

A SUBJECT of considerable chemical interest is dealt with in a recent publication by the British Electrical and Allied Industrial Research Association, 36–38, Kingsway, London, W.C.2, entitled "The Prevention of Trouble due to Aquatic Growths in Condenser Systems with Special Reference to the Destruction of Mussels," being a critical résumé by D. V. Onslow. A number of members of the Association had asked for assistance in dealing with the problem of aquatic growths, and as a result a questionnaire was sent to manufacturers of plant, especially condensers, and to a number of electrical power stations who are known to have experienced difficulties in the matter.

The gist of the report (which can be obtained from the publishers, price 6d.) is that chlorine gas is acknowledged to be the most satisfactory method to adopt for preventing aquatic growths generally, on condenser tubes and elsewhere, including mussels and limpets in pipes. It emphasises that the Paterson Engineering Co., Ltd., have specialised in this business, over 60 power stations in Great Britain and abroad being now equipped with the "Chloronome" apparatus, adding a measured trace of chlorine gas, generally about one part per 2,000,000 to the cooling water.

In the first place, as now generally well known, the prevention of non-conductive organic growths on the condenser tubes, allows the full vacuum in the turbine to be maintained, and the importance of the matter will be obvious when it is remembered that ½ in. drop in the vacuum corresponds to 1 per cent. increase in the steam consumption. Also such sterilisation prevents the growth of weeds in cooling towers and, as stated, of shell-fish such as mussels and limpets in pipe circuits when the cooling water is brackish water or sea water.

The first power station in the world equipped on these lines was Hackney, in 1922, where the total net saving is about £1,600 per annum with a plant of 6,000 k.w., and 48,000,000 gallons of cooling water per 24 hours, made up of saving in labour, since the condensers no longer require cleaning, and increased efficiency of the turbine after deducting the cost of the chlorine.

Some other typical power stations in London fitted, with the water treated in gallons per 24 hours given in parentheses, are Charing Cross Electricity Co. (72,000,000); Poplar (48,000,000); West Ham (42,000,000); and St. Marylebone (28,800,000), while a number of Dockyard power plants are also fitted, such as Devonport, Portsmouth and Chatham. Chlorination on these lines is, of course, already in wide use for towns water supply, sewage and sewage effluents, and swimming baths. The original installation at Hackney was carried out on the suggestion of Sir Alexander Houston of the Metropolitan Water Board, a large proportion of the London water supply being treated on these lines.

Tunisian Phosphate Activity

THE improved labour situation in Tunisia has contributed materially to the satisfactory conditions now ruling in the phosphate industry. The total phosphate exports in 1929 reached a peak figure of 3,017,718 tons, but the production for the second quarter of the present year represents a 31 per cent. increase over the corresponding figures:—

	Production. 1929 Tons.	Production. 1930 Tons.	Exports. 1930 Tons.
April-June	622,000	814,000	685,000
January-June	1,371,000	1,513,000	—

Experiments by Fuel Society of Japan

EXPERIMENTS on the development of low-temperature wood preservatives have been conducted under the auspices of the Fuel Society of Japan since 1925. The low temperature tar oils so used have been obtained largely from Fushun and Hokkaido coal. The bulk of the consumption—amounting to 300 tons in 1927, 700 tons in 1928, and 900 tons in 1929—was sold to the Railway Bureau. These quantities are too small to have affected the Japanese market for creosote oil, 45,000 tons of which are used annually in wood preservation.

Position of the Rayon Industry

Mr. Ernest Walls's Review

A REVIEW of conditions in the rayon industry was given by Mr. Ernest Walls (chairman) at the second ordinary general meeting of the North British Artificial Silk Co., Ltd., held in London on Thursday, October 9. The past year, he said, ha d been marked by extraordinary price reductions, equivalent to 36 per cent. on the net price. Hitherto rayon as a new product had enjoyed a great advantage in not being subject to violent price fluctuations due to natural causes as was the case with cotton and wool, and these reductions had destroyed both the stability of rayon prices and the confidence of the textile trade. The development of rayon must be along the lines of quality and improvement rather than low price, and, paradoxical as it might seem, an increased price would probably be productive of greater consumption.

Over-Production or Under-Consumption

There had been a good deal said in the Press recently abou t over-production of rayon. He preferred to call it under-consumption, and a contrast with the American position would show that this was right. In America, during the past few years, every device of modern publicity has been used by the rayon manufacturers, acting together in an organised way, to develop the use of rayon in every possible direction, and especially to carry it out of the class of cheap substitutes into a field of its own. What had been the result of these methods? During last year (1929), when consumption in this country increased little, if any, the increase in America was 22 million pounds—enough to keep a dozen new factories of their capacity busy and prosperous. The world consumption of rayon had increased since 1924 2.9 times; a remarkable advance which justified belief in the inherent potentialities of the industry. The U.S.A. increase during the same period was well above this average, viz., 3½ times; the U.K. increase well below the average, viz., 1½ times.

If British producers had given the same attention in recent times to propaganda and market development generally that they had given to cutting each other's throats, the statistical position would be very different to-day.

Last year the uncertainty about the duties caused much difficulty in the trade. Was it to be repeated again this year? It was not always realised that there are two distinct and separate duties involved. The first, an excise duty of 1s. a pound was levied on rayon when it was selling at three times to-day's price and levied for revenue as a luxury tax. It should be abolished at the earliest opportunity, since it acted as a restraint on an industry which, on the contrary, should be encouraged and stimulated.

If rayon was to be established in this country as a great and prosperous national new industry, it must continue for some time to receive protection against the prod ucts of foreign countries, which were working on lower labour costs.

Their own factory in the period under review had commenced and reached full development. The factory at Ledburgh had been busy all the time and had never ceased production nor worked short time.

British Celanese, Ltd.

PRESIDING at the eleventh ordinary general meeting of British Celanese, Ltd., in London on Wednesday, Dr. Henry Dreyfus said that the uncertainty created by the threatened removal of the Safeguarding Duties had been one of the main items responsible for the troubles of the artificial silk industry in this country. The silk industry had gone from bad to worse during the past sixteen months. The question of the Duty was again being mentioned publicly, and the matter was in everybody's mind. He suggested that there should be a guaranteed period of two to three years during which no changes should be made.

Continental countries, where wages were 50 per cent. or more below those in this country, had been induced by these conditions to prepare more and more for the wholesale dumping of their goods.

In spite of the world crisis, the depression in this country, and the particular troubles of the artificial silk industry, the results obtained by the British Celanese Co. had shown substantial progress. Their interests in America and Canada were also in a strong position.

Sampling and Analysis of Coal

The Proposed Standard Specifications

AT a meeting of the newly-formed North-Western Section of the Institute of Fuel, held at the Engineers' Club, Manchester, last week, Dr. R. Lessing read a paper upon the subject of the proposed British Standard Specifications for the Sampling and Analysis of Coal. Mr. R. A. Burrows, presided.

Dr. Lessing referred to the work done by a Technical Committee of the B.E.S.A. resulting ultimately in the production of a draft British Standard Specification for the sampling and analysis of coal for export in July, 1929, and a corresponding draft for inland purposes in August, 1930. He added that perhaps the most difficult part of the work undertaken in connection with the adoption of specifications regarding coal was that directed to the standardisation of sampling methods. The Fuel Research Board Committee had already set up a sub-committee for investigating this subject, and, therefore, could not be charged with having taken the primrose path of analysis and neglecting the thorny side of sampling. The difficulties of sampling coal, and particularly unscreened and uncleaned coal, became apparent when one considered the heterogeneous nature, both as regards size of particles and physical characteristics, such as specific gravity, shape, frictional resistance and other surface conditions, of the various components, and in particular, the clean coal particles, shale, pyrites and natural dust.

The methods of sampling incorporated in the B.S. Specification for export purposes were still based on somewhat empirical data. After the issue of that specification the results based upon the work of Grumell and Dunningham became available, which put the sampling problem on a more scientific foundation. The method decided upon, as a result of these researches, and embodied in the specification for home purposes, rightly took account of the ash content of the coal, and regulated the weight of sample required according to the two items, ash percentage and size of particle.

Regard for New Developments

The fact that the specification for home purposes contained important additions to the methods specified in the specification for export purposes drawn up in the previous year would stress the view that these specifications must be regarded as subject to revision from time to time. After all, standardisation must be a means to an end, and not the end in itself, and in order not to defeat its object it must be flexible enough to permit of the new achievements in science and changes in industrial requirements to be assimilated.

This flexibility should commend the specifications for their general acceptance, both at home and abroad, by analysts and by the commercial and industrial interests whom they served. By judicious revision dictated by the experience gained in daily use, any shortcomings of the present recommendations would be eliminated and a gradual tightening up of the standard would follow. The obvious result would be that the coal trade, and particularly the preparation branch of the mining industry, would pay an increasing attention to the quality of its products and would thus enhance the good name of British coal which had been earned by its inherent properties, and maintain or retrieve it where this fuel was in danger of losing its reputation.

Advisory Council for Scientific and Industrial Research

THE SECRETARY of the Department of Scientific and Industrial Research announces that the Lord President of the Council has appointed Mr. E. J. Butler, C.I.E., D.Sc., M.B., F.R.S., Mr. Kenneth Lee, LL.D., and Mr. N. V. Sidgwick, O.B.E., Sc.D., F.R.S., to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research. The following members of the Advisory Council have retired on completion of their terms of office:—Professor V. H. Blackman, Sc.D., F.R.S. (chairman since April, 1930). Professor F. G. Donnan, C.B.E., D.Sc., LL.D., F.R.S., Professor F. A. Lindemann, Ph.D., F.R.S. The appointment of Professor Sir Ernest Rutherford, O.M., Pres. R.S., to be Chairman of the Advisory Council as from October 1, 1930, was announced in May last.

From Week to Week

A GRANT of £59,000 has been made by the Carnegie Trust towards the cost of erecting new chemistry buildings at Glasgow University.

THE INTERNATIONAL CONGRESS on the study of scientific methods applied to the examination and preservation of works of art was opened at Rome on Monday. About 150 experts and directors of museums attended.

UNITED WATER SOFTENERS, LTD., Aldwych House, Kingsway, London, have forwarded a list of orders they have recently booked from all parts of the world for Lassen-Hjort plant, Zerolit and Permutit units and sand filters, with a total capacity of nearly two and a half million gallons a day.

THREE MEN were injured as the result of the explosion of a high pressure cylinder of ammonia while they were charging a refrigerating plant in the Stockport Co-operative Society's butchering department on Tuesday. They were taken to the Infirmary suffering from severe burns about the face and body.

RECENT WILLS include: Mr. Richard James Reynolds, of 5, Norman Road, Heaton Moor, Lancashire, formerly for many years a representative of the British Drug Houses, Ltd., and a director of Heaton Squire and Francis, Ltd., cne of the component houses of the British Drug Houses, Ltd. (net personality £7,326), £8,048.

UNIVERSITY NEWS.—*Cambridge:* Mr. S. E. Janson, B.A., of Gonville and Caius College, has been appointed Assistant to the Professor of Chemistry. *Sheffield:* Mr. J. C. Speakman, M.Sc. (Sheffield) has been appointed Assistant Lecturer in Chemistry, and Mr. G. T. Foxlee, B.Sc. (London), Junior Investigator for Research in Electro-Deposition.

MR. S. STEPHEN HUGHES, chief engineer of the Cellulose Acetate Silk Co., Ltd., it is announced, has offered his resignation to the board on the ground that he "cannot see any prospect of further financial advancement with the company." The accounts of the undertaking, which was formed in 1928, showed an excess of expenditure over income for the year ended March 29 last of £65,747.

THE EXPERIMENTAL PLANT which has been used recently in the separation of bitumen from the tar sands of Northern Alberta, Canada, has been sold by the Alberta Research Council to Mr. Max W. Bull, a petroleum engineer of Denver, Colorado, U.S., for about £1,850, and is to be re-designed, re-equipped and enlarged by the purchaser for use in the commercial development of bituminous sand.

SIR ERNEST BENN gave a luncheon party on Tuesday at the Reform Club to meet Mr. Henry Ford. Among those present were Mr. Arnold Bennett, Sir Hugh Bell, Mr. R. D. Blumenfeld, Mr. Cecil Harmsworth, Sir Walter Layton, the Hon. Harold Nicholson, Sir Percival Perry, Mr. Gordon Robbins, Sir Alexander Roger, the Rt. Hon. Walter Runciman, M.P., Mr. J. A. Spender, Mr. J. A. Benn and Mr. E. G. Benn.

THE CHEMICAL INDUSTRY CLUB is holding its annual meeting at 2, Whitehall Court, London, on Friday, October 31. Among the business will be the election of five candidates to fill vacancies on the Committee, caused by the retirement of present members, three of whom offer themselves for re-election. Nominations of candidates, signed by two members of the Club, must reach the Secretary not later than first post on Monday next.

BLAIR, CAMPBELL AND M'LEAN, LTD., chemical engineers, Glasgow, have acquired the business of the Harvey Engineering Company, in voluntary liquidation, and in future will be known as Blairs, Ltd., Glasgow Engineering Works, Glasgow. The firm of Blair, Campbell and M'Lean was established in 1838, and supplies complete equipment for distilleries, breweries, chemical and allied industries, food products, artificial silk, and tannin extract.

DIRECTORS AND MEMBERS of the sales staff of the Graesser-Monsanto Chemical Works, Ltd., spent a pleasant evening at the Holborn Restaurant, London, on Monday, at a dinner given in honour of the new chairman and managing director, Dr. L. F. Nickell, who recently joined the English board after over fourteen years' service with the Associated Company at St. Louis, U.S.A. Dr. Nickell's address held a quiet note of confidence for the future, and he spoke with pride of the spirit of co-operation which he had experienced on all sides since his arrival in England.

TWO DIRECTORS of the British and South Pacific Trading Co., Ltd. have retired in Mr. E. C. Goddard and Mr. S. H Monilaws. Mr. S. H. Monilaws has also retired from the board of Aikman (London), Ltd.

HUNDREDS OF REFRIGERATORS, using sulphur dioxide, have recently been sold to Rio de Janeiro as a result of a city ordinance requiring all meat and fish sellers to provide mechanical refrigeration for preserving their goods.

THE NEWCASTLE CHEMICAL INDUSTRY CLUB inaugurated its winter session on Tuesday, October 7, when the President, Mr. Robert Bowran, entertained the members at Tilley's Restaurant. A most enjoyable time was spent by a large company.

TWO NEW SECTIONS are being formed in the next British Industries Fair in London, to be held at Olympia from February 16 to 27. One which is to occupy 2,000 square feet is being arranged by the British Plastic Moulding Trade Association, representing an industry which is stated to have multiplied 20 times in the last four years.

IN THE COMPANIES COURT on Tuesday, Mr. Justice Maugham made an order for the compulsory winding up of the Metal Ore and Chemical Co., Ltd., on the petition of West Deutsche Knockenverwertungs Genossenschaft G.-H.M.B., of Neuss near Düsseldorf, judgment creditors. Council for the petitioners said he had received no notice of opposition, and the company did not appear.

MR. M. C. HARMAN, chairman of the Branston Artificial Silk Co., Ltd., states, it is announced by *Fairchild's Bulletin*, that negotiations have been dropped indefinitely in the proposed association of Branston's with the Chatillon acetate group. This was to have involved the formation of a British Chatillon Co., to take over and add an acetate plant at Branston's viscose factory, which has now stopped producing.

THREE WAGONS, each capable of transporting 50 tons of sulphate of ammonia, the largest type used on British railways, have just been put into service by the L.N.E.R. at Middlesbrough for expediting traffic from the Billingham works of the Imperial Chemical Industries, Ltd., to the Middlesbrough Dock. They are the first of a consignment of between forty and fifty wagons of this type which are to be used on Teesside.

THE HORACE BROWN MEMORIAL MEDAL, awarded by the Council of the Institute of Brewing for eminent services on the scientific or technical side of the Fermentation Industries, will be presented to Dr. E. S. Beaven by the President (Mr. Percy Gates) at the Institution of Electrical Engineers, Savoy Place, London, on November 21. Dr. Beaven will deliver the Memorial Lecture, for which he has chosen as his subject "The Culture of Barley for Brewing."

CHANGE OF ADDRESS.—On and after October 20, the new address of the National Federation of Associated Paint, Colour and Varnish Manufacturers of the United Kingdom, The Research Association of British Paint, Colour and Varnish Manufacturers, Joint Industrial Council of the Paint, Colour and Varnish Industry, London Colour, Paint and Varnish Manufacturers' Association, The Colour Makers' Association, and Tung Oil Estates, Ltd., will be at Tavistock House (North), Tavistock Square, London. Telegraphic Address: Paicolvar, Westcent, London. Telephone: Museum 4952.

A PAPER prepared by Mr. Alfred L. Holton, chief engineer of the Manchester Corporation Gas Department, and Mr. H. C. Applebee, chief chemist of the same department, dealing with the utilisation of coke breeze, was read at a meeting of the Manchester District Institution of Gas Engineers on Friday, October 10. In many gasworks, the paper stated, the problem of finding a profitable outlet for coke breeze was a serious one, and had led, in the case of the Manchester Corporation Gas Department, to the consideration of the practicability of utilising coke breeze to make producer gas and of using this gas for the heating of horizontal retort settings. A Trefois producer of the type which had been seen at Moll, in Belgium, had proved completely satisfactory for the manufacture of producer gas from materials which would otherwise have been virtually useless.

Obituary

MR. ANDREW M'NAB, a partner of the firm of John M'Nab and Sons, Ltd., dyers and bleachers, Mortonfield, Howwood, and a director of the Bleachers' Association.

Patent Literature

The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Abstracts of Accepted Specifications

333,506–7. Dyes and Intermediate Products. D. A. W. Fairweather, J. Thomas, and Scottish Dyes, Ltd., Earls Road, Grangemouth. Application date, February 8, 1929.

333,506. Cotton, wool, silk and artificial silk are dyed with esters of reduced quinones or reduced vat dyes, including indigoid dyes, containing azo linkages. The dyestuffs may be employed as azo dyes and the dyeings may be developed by hydrolysis and oxidation. The dyestuffs are obtained by diazotising esters of reduced quinones or vat dyes containing amino groups and coupling with the usual components as in Specification No. 333,507 below, or esters containing amino or hydroxy groups may be coupled with diazo compounds. In an example, cotton, wool or silk is dyed with a dyestuff obtained by coupling 2-diazo-anthrahydroquinone-9:10-disulphuric ester with β-naphthol or 5-chlor-2-toluidide of 2:3-oxynaphthoic acid. The dyeings are developed in a bath containing ferric chloride and hydrochloric acid. A large number of other examples of dyeing and printing are given.

333,507. Azo dyes are obtained by diazotising esters of reduced quinones such as anthraquinones and reduced vat dyes, including indigoid dyes, and coupling with the usual components. Examples are given of the diazotising of 2-amino-anthrahydroquinone-9:10-disulphuric ester, 2-amino-3-chloranthrahydroquinone-9:10-disulphuric ester, etc., and the coupling components mentioned include β-naphthol-2:3-oxynaphthoic-5-chlor-2-toluidide, 1:5-amino-naphthoic acid, 5 : 5¹-dioxy-2:2¹-dinaphthylurea-7:7¹-disulphonic acid, etc. A large number of examples are given.

333,511. Hydrocarbons. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, April 2, 1929.

Crude unsaturated hydrocarbons are treated with hydrogen in the presence of catalysts containing oxides or sulphides of groups 2 to 7, in conjunction with metals of group 8 or heavy metals of group 1. This treatment renders oxygen, nitrogen, sulphur, halogen compounds and resinous substances non-injurious. The hydrocarbons are partly hydrogenated, and hydrogenation is completed in the presence of hydrogenating catalysts which are activated by the addition of compounds of metals of groups 2–7. Examples are given of the treatment of solvent naphtha, brown coal distillation fraction, gas oil, naphthalene and anthracene.

333,513. Dyes. Imperial Chemical Industries, Ltd., Millbank, London, and R. Brightman, Crumpsall Vale Chemical Works, Blackley, Manchester. Application date, April 11, 1929. Addition to 330,607. (See The Chemical Age, Vol. XXIII, p. 148.)

Regenerated cellulose materials are dyed with trisazo dyes containing at least two carboxylic groups or two sulphonic groups or one of each, obtained by coupling tetrazotised 3-aminobenzene-1¹-azo-4¹-aminonaphthalene or a nuclear substitution product with one molecular proportion of a naphthol, phenol, or a carboxylic or sulphonic acid thereof, and one molecular proportion of the same or another component other than a naphthol-aryl-ketone or an arylide of 2:3-oxynaphthoic acid. These products are also obtained by coupling diazotised 3-nitrobenzene-1¹-azo-4¹-amino-naphthalene or a nuclear substitution product with a phenol, naphthol or a carboxylic or sulphonic acid thereof, reducing the nitro group, diazotising the amino group and coupling with suitable components. In an example, the monoazo dyestuffs 3-nitraniline →1-naphthylamine is diazotised and coupled with salicylic acid, the nitro group reduced, and the amino disazo product diazotised and coupled with 2:8:6-amino-naphthol-sulphonic-acid to obtain a product which dyes viscose deep brown.

333,518. Treating Superphosphates. L. Adelantado, 76, Paseo de Gracia, Barcelona, Spain. Application date, May 9, 1929.

Superphosphate is neutralised by means of gaseous or aqueous ammonia, and lixiviated with hot or cold water, which may be slightly acidulated with sulphuric acid. The liquor is crystallised to obtain mono-calcium phosphate with some dicalcium phosphate, ammonium phosphate and ammonium sulphate. Alternatively, the calcium may be precipitated by sulphuric acid and the phosphoric acid purified by adding alcohol, filtering, and distilling off the alcohol. The phosphoric acid may be converted into alkali phosphates.

333,553. Obtaining Light Oils. Naamlooze Vennootschap Mijnbouw-en Cultuurmaatschappij Boeton, 31, Raadhuisstraat, Amsterdam. International Convention date, January 16, 1929.

High boiling hydrocarbons containing unsaturated compounds are treated at 70°–100° C. with a concentrated aqueous solution containing at least 58 per cent. of solid hygroscopic chlorides of heavy metals. The salt solution is removed and the resulting heavy oil distilled to decolorise it and convert it into low boiling hydrocarbons. In an example, crude petroleum boiling at 150°–250° C., containing 60 per cent. of unsaturated compound, is treated with ferric chloride solution of 1·6 Specific Gravity. The oil is separated, neutralised and distilled, yielding 30 per cent. of petrol, 50 per cent. of kerosene, and a high boiling residue.

333,561. Halogenated Hydroxy Arylmethanes. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, May 11, 1929.

Hydroxy-aralkyl alcohols or hydrols, or their anhydrides obtained by condensing aldehydes, except aromatic oxy-aldehydes and their sulphonic, carboxylic or sulpho-carboxylic acids, with *p*-halogen phenols or naphthols containing a free ortho position to the hydroxy group, and no salt forming group, are condensed with a further molecular proportion of the same or different *p*-halogenated phenol or naphthol to obtain a moth-proofing substance. In an example, the hydrol anhydride obtained from benzaldehyde-*o*-sulphonic acid and 2:4-dichlor-phenol is condensed with a further molecular proportion of 2:4-dichlor-phenol or β-chlor-phenol, using sulphuric acid, a mixture of hydrochloric and glacial acetic acids, or zinc chloride as condensing agent.

333,568. Dye Intermediates. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, February 15, 1929.

Halogen, nitro and hydroxy substituents are introduced into benzanthrone-Bz1-alkyl ethers having the Bz2-position free. Examples are given in which Bz1-methoxy-benzanthrone, 6-chlor-and 8-chlor- Bz1-methoxy-benzanthrone and 6-nitro-Bz1-methoxy-benzanthrone are nitrated, Bz1-methoxy-benzanthrone is brominated and chlorinated, Bz1-ethoxy-benzanthrone is chlorinated, Bz1-methoxy-benzanthrone is oxidised to Bz1:Bz2-dihydroxy-benzanthrone, which may be methylated to Bz2:Bz2¹-dimethoxy-benzanthrone. The preparation of the starting materials is indicated.

333,573. Dyes. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, May 10, 1929.

Azo dyestuffs obtained from tetrazotised benzidine-3:3¹-dicarboxylic acid and two molecular parts of aryl- or aroyl-amino-naphthol-sulphonic acids in which the aryl or aroyl residue is substituted by groups inducing solubility in water, are treated with an agent yielding copper. Alternatively, the dyestuff coupling may be effected in the presence of an agent yielding copper, or a dye bath may be made up with the dyestuff with the addition of a coppering agent. In an example, the dyestuff benzidine-3:3¹-dicarboxylic acid $\rightrightarrows$ 7¹-sulpho-5¹-hydroxy-2¹ napthyl-4-amino-phenoxy-acetic acid is treated with copper sulphate. Aryl- and aroyl-amino-naphthol-sulphonic acid, substituted in the aryl or aroyl residue by groups inducing solubility in water, are made by Bucherer's reaction. A large number of examples are given.

333,666–7. Dye Intermediates. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, June 4, 1929.

333,666. 1-aralkyl-naphthalene or a substitution product unsubstituted in the 4-position is treated with carboxylic acid chlorides to obtain 1-aralkyl naphthalene-4-ketones. The corresponding naphthalene-1:4-diketones or 1-aroyl-naphthalene-4-carboxylic acids are obtained by oxidation. In an example, 1-benzyl-naphthalene is condensed with benzoyl chloride or acetyl chloride to obtain the corresponding 1-benzyl-naphthalene-4-ketones which are oxidised with nitric acid to obtain 1:4-dibenzoyl-naphthalene and 1-benzoyl-naphthalene-4-carboxylic acid. Another example describes the treatment of 4^1-chlor-benzyl-1-naphthalene.

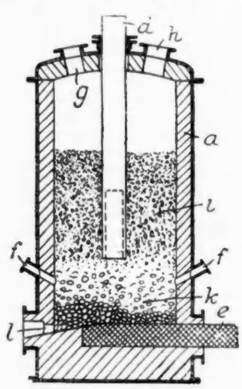
333,667. 1-alkyl-naphthyl-4-ketones which are obtained from 1-alkyl-naphthalenes and carboxylic acid chlorides by the Friedel-Crafts reaction are oxidised with nitric acid or sodium hypochlorite. Thus, 1-methyl-naphthyl 4-phenyl ketone, on oxidation with nitric acid, yields 4-benzoyl-1-naphthoic acid, and 1-methyl-naphthyl-4-methyl-ketone on oxidation with sodium hypochlorite yields 1-methyl-4-naphthoic acid and with nitrc acid the 1:4-dicarboxylic acid.

333,670. Stannic Hydroxide. J. J. Etridge, Norton Hall, The Green, Norton-on-Tees, and Imperial Chemical Industries, Ltd., Millbank, London. Application date, June 5, 1929.

A stannic salt solution is precipitated by adding ammonia gradually with constant stirring, to obtain stannic hydroxide gel. Catalytic oxides may be co-precipitated with the gel, or salts of the oxides, *e.g.*, cobalt nitrate, may be absorbed. Ammonium vanadate solution may be added to the stannic hydroxide sol before gelation, and the product then contains vanadium oxide. The gel is washed, dried for 5 days at 25° C. and 2 days at 120° C. and is activated by heating to 600° C. It may be used for the catalytic oxidation of sulphur dioxide.

333,741. Magnesium Chloride. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, October 4, 1928.

Magnesite, magnesia, or hydrated magnesia is heated with carbon and chlorine to obtain anhydrous magnesium chloride.



333,741

Chlorine is passed through a loose mixture of magnesite and wood or peat charcoal at a temperature above the melting point of magnesium chloride, *e.g.*, 700°—900° C. and the molten magnesium chloride immediately removed in a direction opposite to that of the current of chlorine. A fireproof brickwork shaft *a* contains a layer *k* of coarse-grained carbon and the reaction mixture *i*, and is provided with heating electrodes *e*, *d*, the lower end of the latter being tubular. Chlorine enters at *f* and is drawn off at *h*, and the molten magnesium chloride is drawn off at *l*. The reaction mixture is fed in at *g*.

333,762. Dyes. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, September 4, 1929.

Pure dimethoxy-dibenzanthrone is chlorinated in an inert organic solvent in the presence of a metal salt, *e.g.*, iron chloride, as catalyst, and an acid fixing agent. Other halogenating catalysts specified are iron fluoride, ferric sulphate nickel chloride, cobaltous chloride, and antimony pentachloride, and examples are given.

333,783. Dye Intermediates. W. W. Groves, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, September 28, 1929.

m-Arylamino-phenols are obtained by condensing resorcinol with arylamines, and the aryl group may contain as substituents halogens, methyl or methoxy groups. A dry alkali salt of a *m*-arylamino-phenol is treated with carbon dioxide at a raised temperature and pressure. Examples are given of the treatment of aniline, *o*-, *m*, and *p*-toluidine, *o*-, and *p*-anisidine *m*,- and *p*-xylidine, 2-methyl-*p*-anisidine, *p*-amino-diphenyl ether, *o*-, *m*-, and *p*-chloraniline, 5-chloro-2-toluidine, 4-chloro-2-toluidine, 6-chloro-3-toluidine, 2-chloro-4- toluidine, 2:4-dichloraniline, 3:4-dichloraniline and 4:5-dichloraniline.

333,797. Treating Phosphates. Chemieverfahren-Ges., 15, Wilhelmstrasse, Bochum, Germany. International Convention date, November 28, 1928.

Crude phosphate is treated with potassium sulphate and nitric acid and potassium-calcium sulphate is precipitated with gypsum. The precipitate is washed with water and then with the acid used in this process and again with water. Potassium sulphate is thereby recovered.

333,805. Calcium-alkali Phosphates. A Messerschmitt, Villa Miramar, Suvigliana, Lugano, Switzerland. International Convention date, October 23, 1928. Addition to 300,961. (See The Chemical Age, Vol. XX, p. 82.)

Calcium alkali phosphate is obtained from raw phosphate, alkali sulphate and sufficient carbon to reduce completely the alkali sulphate. Sufficient silica is present to bind any free alkali or alkaline earth, and the sulphur is recovered in elementary form, the product being free from sulphides.

333,834. Alkali Carbonates and Barium Silicate. International Industrial and Chemical Co., Ltd., 120, St. James Street, Montreal, Canada. International Convention date, November 21, 1928.

Alkali sulphates and barium silicates react to form alkali silicates and barium sulphate, and the mixture is treated with carbon dioxide to produce alkali carbonate and residue of silica and barium sulphate, which is calcined to regenerate barium silicate. Sulphur dioxide is liberated and may be used to produce alkali sulphate from alkali chloride.

333,835. Aluminium Sulphate and Nitrate. M. Buchner, 1, Schellingstrasse, Kleefeld, Hanover, Germany. International Convention date, November 24, 1928.

Solid aluminium nitrate is treated with concentrated sulphuric acid up to 300° C. under reduced pressure to obtain aluminium sulphate. The nitric acid evolved may be used to treat aluminous raw material, first at ordinary temperature and pressure, and then at high temperature and pressure, to yield aluminium nitrate solution. Pure aluminium nitrate free from iron is precipitated by means of concentrated or gaseous nitric acid.

Note.—Abstracts of the following specifications which are now accepted, appeared in The Chemical Age when they became open to inspection under the International Convention :—308,218 (I.G. Farbenindustrie Akt.-Ges.), relating to basic products from imido ethers of higher fatty acids, see vol. XX, p. 507; 311,336 (I.G. Farbenindustrie Akt.-Ges.), relating to isatoic acid anhydride and derivatives thereof, see Vol. XXI, p. 34; 311,737 (Lazote Inc.), relating to manufacture of hydrogen, see Vol. XXI, p. 58; 313,493 (I.G. Farbenindustrie Akt.-Ges.), relating to indigoid vat dyestuffs, see Vol. XXI, p. 156; 313,877 (Rohm und Haas Akt.-Ges.), relating to unsaturated esters, see Vol. XXI, p. 178.

Specifications Accepted with Date of Application

311,226. Alkali sulphates, Production of. Chemieverfahren Ges. May 7, 1928. Addition to 300,630.

312,361. Purifying pig iron. F. Krupp Akt.-Ges. May 25, 1928.

314,803. Indanthrone dyestuffs, Preparation of. Newport Co. July 2, 1928. Addition to 297,692.

314,903. Dyestuffs, Manufacture of. Soc. of Chemical Industry in Basle. July 4, 1928. Addition to 262,774 and 204,486.

314,987. Electrolytic production of white lead. R. J. Frost. July 6, 1928.

315,826–7–8–9. Wrought iron, Methods of making. A. M. Byers Co. July 19, 1928.

318,488. Optically active 1-phenyl-2-methyl-aralkylamino propanols-1- and 1-phenyl-2-methylamino-propanol-1, Manufacture of. I.G. Farbenindustrie Akt.-Ges. September 3, 1928.

335,522. Conversion of hydrocarbons of high boiling point range into valuable products, especially those boiling at low temperatures. I.G. Farbenindustrie Akt.-Ges. April 23, 1929. Addition to 296,700.

335,523. Dyestuffs, Manufacture of. Soc. of Chemical Industry in Basle, F. Straub and W. Anderau. April 23, 1929. Addition to 307,705.

335,524. Mixtures of nitrogen and hydrogen, Manufacture of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*). April 24, 1929.

335,543. Destructive hydrogenation of coal and other carbonaceous materials. H. D. Elkington. (*Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij*). June 24, 1929.

335,551. Alcohols, Manufacture of. H. D. Elkington. (*Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij*). May 23, 1929.

335,555. Insoluble azo dyestuffs, Manufacture of. W. W. Groves. (*I.G. Farbenindustrie Akt.-Ges.*). June 21, 1929.

335,588. Heat resisting alloys. W. Rosenhain and C. H. M. Jenkins. April 23, 1929.

335,596. Lactic and acetic acids, Production of. W. W. Triggs. (*Wisconsin Alumni Research Foundation*). June 20, 1929.

335,600. Urea-containing fertilisers and method for manufacturing same. W. W. Triggs. (*A. B. Lamb*). June 27, 1929.

335,612. Organic materials such as rubber. Liverpool Rubber Co., Ltd. and G Thorne. June 28, 1929.

335,616. Mixed artificial rubbers, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*). June 29, 1929.

335,631. Oxygenated organic compounds, Manufacture of. H. Dreyfus. July 2, 1929.

335,632. Treatment of mixtures containing carbon dioxide and hydrogen for the purpose of reducing or eliminating hydrogen content and the formation of carbon monoxide therefrom. British Celanese, Ltd., W. Bader and E. E. Stimson. July 2, 1929.

335,645. Aromatic amino derivatives from mono-azo compounds, Production of. British Research Association for the Woollen and Worsted Industries and A. T. King. July 6, 1929.

335,646. Amino-azo compounds, containing a β-naphthol component, simultaneously with an aromatic amino derivative, Production of. British Research Association for the Woollen and Worsted Industries and A. T. King. July 6, 1929.

335,683. Synthetic *n*-butyl alcohol, Purification of. R. Riley, S. W. Rowell, and Imperial Chemical Industries, Ltd. August 13, 1929.

335,703. Sodium fluoride, Production of—by dry method. E. V. Britzke, W. I. Brempell and M. E. Jakubowitz. August 29, 1929.

335,705. Azo dyestuff, Manufacture of. I.G. Farbenindustrie Akt.-Ges. October 4, 1928.

335,783. 2:4-di-(3[1]-nitrophenyl)-6-hydroxytriazine-1:3:5, Manufacture of. I.G. Farbenindustrie Akt.-Ges. October 31, 1928.

335,817. Prvidine or its homologues, Process of sulphonating. I.G. Farbenindustrie Akt.-Ges. November 26, 1928.

335,818. α-hydroxy-β-picoline, Manufacture of. I.G. Farbenindustrie Akt.-Ges. November 26, 1928.

335,852. Increasing the grain-size of sulphide ores during the desulphurising operation. Metallges. Akt.-Ges. June 4, 1929.

335,863. Naphthenates of heavy and alkaline earth metals, Production of. I.G. Farbenindustrie Akt.-Ges. February 22, 1929.

Applications for Patents

[In the case of applications for patents under the International Convention, the priority date (that is, the original application date abroad which the applicant desires shall be accorded to the patent) is given in brackets, with the name of the country of origin. Specifications of such applications are open to inspection at the Patent Office on the anniversary of the date given in brackets, whether or not they have been accepted.]

Böhme Akt.-Ges., H. T. Wetting, etc. agents. 30,135. October 8. (Germany, November 4, 1929.)
— Production of primary alcohols. 30,136. October 8. (Germany, November 25, 1929.)
— Reduction of organic compounds. 30,137. October 8. (Germany, November 27, 1929.)
— Reduction of organic compounds. 30,195. October 8. (Germany, December 9, 1929.)

Carpmael, A. and I.G. Farbenindustrie Akt.-Ges. Manufacture of fast vat dyestuffs. 20,878. October 6.
— Manufacture of coloured masses of artificial rubber-like masses. 29,879. October 6.
— Manufacture of nitro arylamino derivatives of leuco sulphuric acid esters of anthraquinoid, etc. 30,007. October 7.
— Manufacture of coloured masses from rubber, etc. 30,008. October 7.
— Process for inhibiting development of micro-organisms. 30,021. October 7.

Cawley, C. M., Matthews, M. A. and Wiltshire, J. L. Destructive hydrogenation of carbonaceous materials. 30,236. October 9.

Davis, W. A., Distillers Co., Ltd. and Salt, F. E. Protection of copper apparatus from acids. 30,128, 30,129. October 8.

Groves, W. W., and I.G. Farbenindustrie Akt.-Ges. Manufacture of stable reduction compounds of vat-dyestuffs. 30,275. October 9.

Gutehoffnungshütte Oberhausen Akt.-Ges. Production of ammonium salts. 30,347. October 10. (Germany, October 12, 1929.)

Hene, E. Producing formiate of potassium. 30,111. October 8.

I.G. Farbenindustrie Akt.-Ges. Splitting fats and oils. 29,853. October 6.
— Production of assistants in production of vulcanised rubber, etc., goods. 29,854. October 6.
— Production of cyanamides of alkaline earth metals. 29,855. October 6.
— Production of iodised yeast. 29,856. October 6.
— Production of fatty acids. 29,857. October 6.
— Removal of iron, etc. from substances. 29,858. October 6.
— Production of wetting, etc., agents. 29,859. October 6.
— Production of hydrogen, etc. 29,860. October 6. (April 8, 1929.)
— Recovery of fatty acids from oxidation products of hydrocarbons. 29,956. October 7.
— Treatment of hydrocarbons in electric arc. 30,010. October 7.
— Removal of phenols from hydrocarbons. 30,148. October 8.
— Manufacture of absorbent silicic acid. 30,149. October 8.
— Manufacture of metal carbonyls. 30,150. October 8.
— Washing wool. 30,151. October 8.
— Apparatus for working up tars, etc. 30,152. October 8.
— Manufacture of fertilisers. 30,153. October 8.
— Manufacture of organic acid chlorides. 30,154. October 8.
— Manufacture of anthraquinone derivatives. 30,155. October 8.
— Manufacture of stable reduction compounds of vat dyestuffs. 30,275. October 9.
— Direct production of siccatives in solution. 29,928. October 6. (Germany, October 10, 1929.)
— Production of dry high-grade calcium hydrochlorite. 29,929. October 6. (Germany, October 28, 1929.)
— Reaction towers. 30,031. October 7. (Germany, October 7, 1929.)
— Bellows cameras. 30,276. October 9. (Germany, October 10, 1929.)

Imperial Chemical Industries, Ltd. Granular fertilisers. 29,829. October 6.
— Treatment of dyed materials. 29,923. October 6.
— Electrical connections. 29,930. October 6.
— Pickling metals. 30,126, 30,127, 30,131. October 8. (United States, October 9, 1929.)
— Dyeing. 30,251. October 9.
— Destructive hydrogenation of carbonaceous materials. 30,481. October 11.
— Treatment of cut grass, etc. 30,482. October 11.

Newport Chemical Corporation. Anthraquinone bodies. 30,403. October 10. (United States, October 19, 1929.)

New Benn Publications

WORKS announced for early publication by Ernest Benn, Ltd., include the following :—

My Friend Mr. Edison, by Henry Ford, in collaboration with Samuel Crowther ; an intimate, personal account of the lifelong friendship between two of the greatest men of our time. *The Verney Letters*, edited by the late Margaret, Lady Verney, 2 vols., 42s. set. *Reparation Reviewed*, by Sir Andrew McFadyean, 8s. 6d. net. *Charing Cross Bridge*, by Arthur Keen, F.R.I.B.A., 21s. net, a complete review of the urgent problem facing Greater London. 39 *Months*, by D. Victor Kelly, 8s. 6d. net. ; the war in France as seen by an officer of the 110th Infantry Brigade.

Great Italian Short Stories, edited by Lewis Melville and Reginald Hargreaves (8s. 6d.). *Twice Dead*, by E. M. Channon (7s. 6d.). A murder story by the author of *The Chimney Murder. They Thought They Could Buy It*, by Dorothy Walworth Carman (7s. 6d.). *Crowner's Quest*, by Adam Broom (7s. 6d.). *The Magic City, The Wonderful Garden* and *The Magic World* (3s. 6d. each), three additions (hitherto published by Macmillan) to the Ernest Benn series of children's books by E. Nesbit. *The Passion Play at Oberammergau*, 1930 (4s. 6d.).

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.

General Heavy Chemicals

ACID ACETIC, 40% TECH.—£19 per ton.

ACID CHROMIC.—1s. 0⅜d. per lb. d/d U.K.

ACID HYDROCHLORIC.—Spot, 3s. 9d. to 6s. carboy d/d, according to purity, strength and locality.

ACID NITRIC, 80° Tw.—Spot, £20 to £25 per ton makers' works, according to district and quality.

ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations; 140° Tw., Crude acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

AMMONIA (ANHYDROUS).—Spot, 11d. per lb., d/d in cylinders.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

BISULPHITE OF LIME.—£7 10s. per ton, f.o.r. London, packages free.

BLEACHING POWDER, 35/37%.—Spot, £7 10s. per ton d/d station in casks, special terms for contracts.

BORAX, COMMERCIAL.—Crystals, £13 10s. per ton; granulated, £12 10s. per ton; powder, £14 per ton. (Packed in 1 cwt. bags. carriage paid any station in Great Britain. Prices quoted are for one ton lots and upwards).

CALCIUM CHLORIDE (SOLID), 70/75%.—Spot, £4 15s. to £5 5s. per ton d/d in drums.

CHROMIUM OXIDE.—9½d. and 10d. per lb. according to quantity d/d U.K.

CHROMETAN.—Crystals, 3½d. per lb. Liquor, £18 10s. per ton d/d U.K.

COPPER SULPHATE.—£25 to £25 10s. per ton.

METHYLATED SPIRIT 61 O.P.—Industrial, 1s. 7d. to 1s. 11d. per gall. pyridinised industrial, 1s. 9d. to 2s. 1d. per gall.; mineralised, 2s. 8d. to 2s. 11d. per gall. 64 O.P., 1d. extra in all cases. Prices according to quantity.

NICKEL SULPHATE.—£38 per ton d/d.

NICKEL AMMONIA SULPHATE.—£38 per ton d/d.

POTASH CAUSTIC.—£30 to £33 per ton.

POTASSIUM BICHROMATE CRYSTALS AND GRANULAR.—4½d. per lb. nett d/d U.K., discount according to quantity; ground ½d. per lb. extra.

POTASSIUM CHLORATE.—3⅞d. per lb., ex-wharf, London, in cwt. kegs.

POTASSIUM CHROMATE.—8d. per lb. d/d U.K.

SALAMMONIAC.—Firsts lump, spot, £42 10s. per ton d/d station in barrels. Chloride of ammonia, £37 to £45 per ton, carr. paid.

SALT CAKE, UNGROUND.—Spot, £3 7s. 6d. per ton d/d station in bulk.

SODA ASH, 58° E.—Spot, £6 per ton, f.o.r. in bags, special terms for contracts.

SODA CAUSTIC, SOLID, 76/77°E.—Spot, £14 10s. per ton, d/d station.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton, d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE 97/98%.—£21 per ton.

SODIUM BICARBONATE, REFINED.—Spot, £10 10s. per ton d/d station in bags.

SODIUM BICHROMATE CRYSTALS.—3⅜d. per lb. nett d/d U.K., discount according to quantity. Anhydrous ⅜d. per lb. extra.

SODIUM BISULPHITE POWDER, 60/62%.—£17 10s. per ton delivered for home market, 1-cwt. drums included; £15 10s. f.o.b. London.

SODIUM CHLORATE.—2⅞d. per lb.

SODIUM CHROMATE.—3½d. per lb. d/d U.K.

SODIUM NITRITE.—Spot, £19 per ton, d/d station in drums.

SODIUM PHOSPHATE.—£14 per ton, f.o.b. London, casks free.

SODIUM SILICATE, 140° Tw.—Spot, £8 5s. per ton, d/d station returnable drums.

SODIUM SULPHATE (GLAUBER SALTS).—Spot, £4 2s. 6d. per ton, d/d address in bags.

SODIUM SULPHIDE SOLID, 60/62%.—Spot, £10 5s. per ton d/d station in drums. Crystals—Spot, £7 10s. per ton d/d station in casks.

SODIUM SULPHITE, PEA CRYSTALS.—Spot, £13 10s. per ton, d/d station in kegs. Commercial—Spot, £9 per ton, d/d station in bags.

Coal Tar Products

ACID CARBOLIC CRYSTALS.—6d. to 7½d. per lb. Crude 60's 1s. 4½d. to 2s. per gall. August/December.

ACID CRESYLIC 99/100.—2s. 2d. to 2s. 3d. per gall. B.P., 5s. per gall. 97/99.—2s. 1d. to 2s. 2d. per gall. Refined, 2s. 7d. to 2s. 10d. per gall. Pale, 95%, 1s. 9d. to 1s. 10d. per gall. 98%, 1s. 11d. to 2s. Dark, 1s. 6d. to 1s. 7d.

ANTHRACENE.—A quality, 2d. to 2½d. per unit. 40%, £4 10s. per ton.

ANTHRACENE OIL, STRAINED, 1080/1090.—4⅞d. to 5½d. per gall. 1100, 5½d. to 6d. per gall.; 1110, 6d. to 6½d. per gall. Unstrained (Prices only nominal).

BENZOLE.—Prices at works: Crude, 8d. to 9d. per gall.; Standard Motor, 1s. 3½d. to 1s. 4½d. per gall.; 90%, 1s. 5d. to 1s. 6d. per gall.; Pure, 1s. 8d. to 1s. 9d. per gall.

TOLUOLE.—90%, 1s. 8d. to 1s. 9d. per gall. Pure, 1s. 10d. to 2s. 2d. per gall.

XYLOL.—1s. 4½d. to 1s. 10d. per gall. Pure, 1s. 7½d. to 2s. 1d. per gall.

CREOSOTE.—Cresylic, 20/24%, 6⅞d. to 7d. per gall.; Heavy, for Export, 6½d. to 6⅞d. per gall. Home, 4d. per gall. d/d. Middle oil, 4½d. to 5d. per gall. Standard specification, 3d. to 4d. per gall. Light gravity, 1½d. to 1⅝d. per gall. ex works. Salty, 7½d. per gall.

NAPHTHA.—Crude, 8½d. to 8⅞d. per gall. Solvent, 90/160, 1s. 2½d. to 1s. 3d. per gall. Solvent, 95/160, 1s. 3½d. to 1s. 6d. per gall. Solvent 90/190, 11d. to 1s. 2½d. per gall.

NAPHTHALENE, CRUDE.—Drained Creosote Salts, £3 to £4 per ton. Whizzed, £4 to £5 per ton. Hot-pressed, £8 per ton.

NAPHTHALENE.—Crystals, £10 per ton. Purified Crystals, £14 10s. per ton. Flaked, £11 per ton.

PITCH.—Medium soft, 46s. to 47s. 6d. per ton, f.o.b., according to district. Nominal.

PYRIDINE.—90/140, 3s. 6d. to 4s. per gall. 90/160, 3s. 6d. to 3s. 9d. per gall. 90/180, 1s. 9d. to 2s. 3d. per gall. Heavy prices only nominal.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:—

ACID AMIDONAPHTHOL DISULPHO (1-8-2-4).—10s. 9d. per lb.

ACID ANTHRANILIC.—6s. per lb. 100%.

ACID GAMMA.—Spot, 3s. 9d. per lb. 100% d/d buyer's works.

ACID H.—Spot, 2s. 3d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 5d. per lb. 100% d/d buyer's works.

ACID NEVILLE AND WINTHER.—Spot, 2s. 7d. per lb. 100% d/d buyer's works.

ACID SULPHANILIC.—Spot, 8½d. per lb. 100% d/d buyer's works.

ANILINE OIL.—Spot, 8½d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8½d. per lb. d/d buyer's works.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra, d/d buyer's works.

BENZIDINE BASE.—Spot, 2s. 6d. per lb. 100% d/d buyer's works.

BENZOIC ACID.—Spot, 1s. 8½d. per lb. d/d buyer's works.

o-CRESOL 30/31° C.—£3 1s. 10d. per cwt., in 1 ton lots.

m-CRESOL 98/100%.—2s. 9d. per lb., in ton lots.

p-CRESOL 34·5° C.—1s. 9d. per lb., in ton lots.

DICHLORANILINE.—1s. 10d. per lb. f.o.r. works.

DIMETHYLANILINE.—Spot, 1s. 8d. per lb., drums extra d/d buyer's works.

DINITROBENZENE.—8d. per lb.

DINITROCHLORBENZENE.—£74 per ton d/d.

DINITROTOLUENE.—48/50° C., 7½d. per lb.; 66/68° C., 9d. per lb., f.o.r. works.

DIPHENYLAMINE.—Spot, 1s. 8d. per lb. d/d buyer's works.

a-NAPHTHOL.—Spot, 1s. 11d. per lb. d/d buyer's works.

B-NAPHTHOL.—Spot, £65 per ton in 1 ton lots, d/d buyer's works.

a-NAPHTHYLAMINE.—Spot, 1s. per lb. d/d buyer's works.

B-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.

o-NITRANILINE.—5s. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 6d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 6½d. per lb., 5-cwt. lots, drums extra, d/d buyer's works.

NITRONAPHTHALENE.—9d. per lb.

R. SALT.—Spot, 2s. per lb. 100% d/d buyer's works.

SODIUM NAPHTHIONATE.—Spot, 1s. 6½d. per lb. 100% d/d buyer's works.

o-TOLUIDINE.—Spot, 8d. per lb., drums extra, d/d buyer's works.

p-TOLUIDINE.—Spot, 1s. 9d. per lb. d/d buyer's works.

m-XYLIDINE ACETATE.—3s. 1d. per lb., ex works.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 to £8 5s. per ton. Grey, £14 to £15 per ton. Liquor, 9d. per gall.

ACETONE.—£73 per ton.

CHARCOAL.—£6 to £8 3s. per ton, according to grade and locality.

IRON LIQUOR.—1s. 3d. per gall. 32° Tw. 1s. per gall. 24° Tw.

RED LIQUOR.—9d. per gall. 16° Tw.

WOOD CREOSOTE.—1s. 9d. per gall., unrefined.

WOOD NAPHTHA, MISCIBLE.—3s. to 3s. 2d. per gall. Solvent, 4s. per gall.

WOOD TAR.—£4 5s. to £5 per ton.

BROWN SUGAR OF LEAD.—£37 per ton.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6d. to 1s. 2d. per lb., according to quality; Crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC SULPHIDE, YELLOW.—1s. 8d. to 1s. 10d. per lb.

BARYTES.—£5 10s. to £7 per ton, according to quality.
CADMIUM SULPHIDE.—4s. 6d. to 5s. per lb.
CARBON BISULPHIDE.—£26 to £28 per ton, according to quantity; drums extra.
CARBON BLACK.—3½d. to 4$\frac{1}{16}$d. per lb., ex wharf.
CARBON TETRACHLORIDE.—£40 to £50 per ton, according to quantity, drums extra.
CHROMIUM OXIDE, GREEN.—1s. 2d. per lb.
DIPHENYLGUANIDINE.—2s. 9d. per lb.
LITHOPONE, 30%.—£20 to £22 per ton.
SULPHUR.—£9 10s. to £13 per ton, according to quality.
SULPHUR CHLORIDE.—4d. to 7d. per lb., carboys extra.
SULPHUR PRECIP. B.P.—£55 to £60 per ton, according to quantity.
VERMILION, PALE OR DEEP.—6s. 6d.-7s. per lb.
ZINC SULPHIDE.—8d. to 11d. per lb.

Pharmaceutical and Photographic Chemicals

ACID, ACETIC, PURE, 80%.—£38 5s. per ton, for ½ ton lots, £37 5s. for 1 ton, smaller quantities £39 5s., delivered, barrels free.
ACID, ACETYL SALICYLIC.—2s. 9d. to 2s. 11d. per lb., according to quantity.
ACID, BENZOIC B.P.—2s. to 2s. 3d. per lb., for synthetic product, according to quantity. Solely ex Gum, 1s. 3d. to 1s. 6d. per oz.; 50-oz. lots, 1s. 3d. per oz.
ACID, BORIC B.P.—Crystal, £31 per ton; powder, £32 per ton; For one-ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.
ACID, CAMPHORIC.—19s. to 21s. per lb.
ACID, CITRIC.—1s. 5¾d. to 1s. 6d. per lb., less 5%.
ACID, GALLIC.—2s. 11d. per lb. for pure crystal, in cwt. lots.
ACID, MOLYBDIC.—5s. 3d. per lb. in ½-cwt. lots. Packages extra. Special prices for quantities and contracts.
ACID, PYROGALLIC, CRYSTALS.—7s. 3d. per lb. Resublimed, 8s. 3d.
ACID, SALICYLIC, B.P. PULV.—1s. 5d. to 1s. 8d. per lb. Technical.—1s. to 1s. 2d. per lb.
ACID, TANNIC B.P.—2s. 8d. to 2s. 10d. per lb.
ACID, TARTARIC.—1s. per lb., less 5%.
AMIDOL.—7s. 6d. to 11s. 3d. per lb., according to quantity.
AMMONIUM BENZOATE.—3s. 9d. per lb.
AMMONIUM CARBONATE B.P.—£36 per ton. Powder, £39 per ton in 5-cwt. casks. Resublimated, 1s. per lb.
AMMONIUM MOLYBDATE.—4s. 9d. per lb. in ½-cwt. lots. Packages extra. Special prices for quantities and contracts.
ATROPHINE SULPHATE.—8s. per oz.
BARBITONE.—5s. 9d. to 6s. per lb.
BISMUTH CARBONATE.—6s. 6d. per lb.
BISMUTH CITRATE.—6s. 9d. per lb.
BISMUTH SALICYLATE.—6s. 7d. per lb.
BISMUTH SUBNITRATE.—5s. 6d. per lb.
BISMUTH NITRATE.—Cryst. 4s. 4d. per lb.
BISMUTH OXIDE.—8s. 6d. per lb.
BISMUTH SUBCHLORIDE.—8s. per lb.
BISMUTH SUBGALLATE.—6s. 9d. per lb. Extra and reduced prices for smaller and larger quantities of all bismuth salts respectively.
BISMUTHI ET AMMON LIQUOR.—Cit. B.P. in W. Qts. 1s. 0½d. per lb.; 12 W. Qts. 11½d. per lb.; 36 W. Qts. 11d. per lb.
BORAX B.P.—Crystal, £21 10s. per ton; powder, £22 per ton; for one-ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.
BROMIDES.—Ammonium, 1s. 9d. per lb.; potassium, 1s. 4½d. per lb.; granular, 1s. 5d. per lb.; sodium, 1s. 7d. per lb. Prices for 1-cwt. lots.
CAFFEIN, PURE.—7s. 6d. per lb.
CAFFEIN CITRAS.—5s. 9d. per lb.
CALCIUM LACTATE.—B.P., 1s. 1½d. to 1s. 6d. per lb., in 1-cwt. lots.
CAMPHOR.—Refined flowers, 3s. to 3s. 2d. per lb., according to quantity; also special contract prices.
CHLOROFORM.—2s. 4½d. to 2s. 7½d. per lb., according to quantity.
EMETINE HYDROCHLORIDE.—58s. 6d. per oz.
EMETINE BISMUTH IODIDE.—33s. per oz.
EPHEDRINE, PURE.—13s. 9d. to 14s. 6d. per oz.
EPHEDRINE HYDROCHLORIDE.—10s. 9d. to 11s. 6d. per oz.
EPHEDRINE SULPHATE.—10s. 9d. to 11s. 6d. per oz.
ERGOSTEROL.—2s. 6d. per gm.
ETHERS.—S.G. ·730—1s. to 1s. 1d. per lb., according to quantity; other gravities at proportionate prices.
FORMALDEHYDE, 40%.—37s. per cwt., in barrels, ex wharf.
GLUCOSE, MEDICINAL.—1s. 6d. to 2s. per lb. for large quantities.
HEXAMINE.—2s. 3d. to 2s. 6d. per lb.
HOMATROPINE HYDROBROMIDE.—27s. 6d. per oz.
HYDRASTINE HYDROCHLORIDE.—85s. per oz. for small quantities.
HYDROGEN PEROXIDE (12 VOLS.).—1s. 4d. per gallon, f.o.r. makers' works, naked. B.P., 10 vols., 2s. to 2s. 3d. per gall.; 20 vols., 3s. per gall.
HYDROQUINONE.—3s. 9d. to 4s. per lb., in cwt. lots.
HYPOPHOSPHITES.—Calcium, 2s. 11d. to 3s. 4d. per lb.; potassium, 3s. 2d. to 3s. 7d. per lb.; sodium, 3s. 1d. to 3s. 6d. per lb.; for 28-lb. lots.
IRON AMMONIUM CITRATE.—B.P., 2s. 5d. per lb., for 28-lb. lots. Green, 3s. 1d. per lb., list price. U.S.P., 3s. 3d. per lb. list price.
IRON PERCHLORIDE.—18s. to 20s. per cwt., according to quantity.
IRON QUININE CITRATE.—B.P., 8¼d. to 8¾d. per oz., according to quantity.
MAGNESIUM CARBONATE.—Light commercial, £31 per ton net.
MAGNESIUM OXIDE.—Light Commercial, £62 10s. per ton, less 2½%; Heavy commercial, £21 per ton, less 2½%; in quantity lower; Heavy Pure, 2s. to 2s. 3d. per lb.
MENTHOL.—A.B.R. recrystallised B.P., 16s. per lb. net; Synthetic, 8s. 6d. to 10s. 6d. per lb.; Synthetic detached crystals, 8s. 6d. to 11s. per lb., according to quantity; Liquid (95%), 9s. per lb.
MERCURIALS B.P.—Up to 1-cwt. lots, Red Oxide, crystals, 8s. 4d. to 8s. 5d. per lb., levig., 7s. 10d. to 7s. 11d. per lb.; Corrosive Sublimate, Lump, 6s. 7d. to 6s. 8d. per lb., Powder, 6s. to 6s. 1d. per lb.; White Precipitate, Lump, 6s. 9d. to 6s. 10d. per lb., Powder, 6s. 10d. to 6s. 11d. per lb., Extra Fine, 6s. 11d. to 7s. per lb.; Calomel, 7s. 2d. to 7s. 3d. per lb.; Yellow Oxide, 7s. 8d. to 7s. 9d. per lb.; Persulph, B.P.C., 6s. 11d. to 7s. per lb.; Sulph. nig., 6s. 8d. to 6s. 9d. per lb. Special prices for larger quantities.
METHYL SALICYLATE.—1s. 3d. to 1s. 5d. per lb.
PARALDEHYDE.—1s. 4d. per lb.
PHENACETIN.—3s. 9d. to 4s. 1d. per lb.
PHENOLPHTHALEIN.—5s. 11d. to 6s. 1½d. per lb.
PILOCARPINE NITRATE.—10s. 6d. per oz.
POTASSIUM BITARTRATE 99/100% (Cream of Tartar).—89s. per cwt., less 2½ per cent.
POTASSIUM CITRATE.—B.P.C., 2s. 2d. to 3s. per lb.
POTASSIUM FERRICYANIDE.—1s. 7½d. per lb., in 125-lb. kegs.
POTASSIUM IODIDE.—16s. 8d. to 17s. 9d. per lb., according to quantity.
POTASSIUM METABISULPHITE.—6d. per lb., 1 cwt. kegs included, f.o.r. London.
POTASSIUM PERMANGANATE.—B.P. crystals, 5½d. per lb., spot.
QUININE SULPHATE.—1s. 8d. per oz. for 1,000-oz. lots.
QUINOPHAN.—B.P.C., 14s. 6d. to 16s. 6d. per lb. for cwt. lots.
SACCHARIN.—43s. 6d. per lb.
SALICIN.—18s. 6d. per lb.
SODIUM BARBITONUM.—8s. 6d. to 9s. per lb. for 1-cwt. lots.
SODIUM BENZOATE B.P.—1s. 9d. per lb. for 1-cwt. lots.
SODIUM CITRATE.—B.P.C. 1911, 1s. 10d to 2s. 8d. per lb. B.P.C. 1923, and U.S.P., 2s. 2d. to 3s. per lb.
SODIUM HYPOSULPHITE, PHOTOGRAPHIC.—£15 per ton, d/d consignee's station in 1-cwt. kegs.
SODIUM NITROPRUSSIDE.—16s. per lb.
SODIUM POTASSIUM TARTRATE (ROCHELLE SALT).—95s. to 100s. per cwt. net. Crystals, 2s. 6d. per cwt. extra.
SODIUM SALICYLATE.—Powder, 1s. 10d. to 2s. 2d. per lb. Crystal, 1s. 11d. to 2s. 3d. per lb.
SODIUM SULPHIDE, PURE RECRYSTALLISED.—10d. to 1s. 2d. per lb.
SODIUM SULPHITE, ANHYDROUS.—£27 10s. to £29 10s. per ton, according to quantity. Delivered U.K.
TARTAR EMETIC, B.P.—Crystal or powder, 1s. 9d. to 2s. per lb.
THYMOL.—Puriss, 7s. 6d. to 8s. 6d. per lb., according to quantity. Natural, 12s. per lb.

Perfumery Chemicals

ACETOPHENONE.—7s. per lb.
AUBEPINE (EX ANETHOL).—12s. per lb.
AMYL ACETATE.—2s. 6d. per lb.
AMYL BUTYRATE.—5s. per lb.
AMYL CINNAMIC ALDEHYDE.—10s. per lb.
AMYL SALICYLATE.—2s. 6d. per lb.
ANETHOL (M.P. 21/22° C.).—7s. per lb.
BENZALDEHYDE FREE FROM CHLORINE.—2s. 6d. per lb.
BENZYL ACETATE FROM CHLORINE-FREE BENZYL ALCOHOL.—1s. 10d. per lb.
BENZYL ALCOHOL FREE FROM CHLORINE.—1s. 10d. per lb.
BENZYL BENZOATE.—2s. 6d. per lb.
CINNAMIC ALDEHYDE NATURAL.—13s. 3d. per lb.
COUMARIN.—12s. per lb.
CITRONELLOL.—8s. per lb.
CITRAL.—8s. per lb.
ETHYL CINNAMATE.—6s. 6d. per lb.
ETHYL PHTHALATE.—2s. 9d. per lb.
EUGENOL.—9s. per lb.
GERANIOL (PALMAROSA).—17s. per lb.
GERANIOL.—7s. 6d. to 10s. per lb.
HELIOTROPINE.—6s. per lb.
ISO EUGENOL.—11s. per lb.
LINALOL, EX BOIS DE ROSE.—6s. per lb. Ex Shui Oil, 6s. per lb.
LINALYL ACETATE, EX BOIS DE ROSE.—8s. 6d. per lb. Ex Shui Oil, 8s. 6d. per lb.
MUSK XYLOL.—6s. 3d. per lb.
PHENYL ETHYL ACETATE.—11s. per lb.
PHENYL ETHYL ALCOHOL.—9s. per lb.
RHODINOL.—46s. per lb.
SAFROL.—1s. 10d. per lb.
TERPINEOL.—1s. 6d. per lb.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co. Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.*

London, October 16, 1930.

THE demand for various chemicals during the current week has been fairly steady. The improved inquiry for export is also maintained.

General Chemicals

ACETONE, £70 10s. to £80 per ton, according to quantity and in steady demand.

ACID ACETIC.—Unchanged and firm at £36 5s. to £37 5s. per ton for technical 80%, and £37 5s. to £39 5s. for pure 80% free, delivered to buyers' works and in steady request.

ACID CITRIC.—Still rather quiet at about 1s. 6d. per lb., less 5%.

ACID LACTIC.—Continues firm at £41 to £42 per ton for the 50% by weight pale quality, with a good demand.

ACID OXALIC CRYSTALS.—In good demand at £30 7s. 6d. per ton to £32 per ton according to quantity.

ACID TARTARIC.—Rather quiet at 1s. to 1s. 0½d. per lb., less 5%.

ALUMINA SULPHATE.—Continues firm at £8 to £8 15s. per ton for the 17/18% iron free quality.

CREAM OF TARTAR.—There is a firmer tendency at 87s. 6d. to 88s. per cwt., ex warehouse London.

COPPER SULPHATE.—Unchanged at about £21 to £21 10s. per ton, free on rails London.

FORMALDEHYDE.—In good demand at £32 per ton, ex wharf London for 40% by volume.

LEAD ACETATE.—A little easier at £37 per ton for white and £36 per ton for brown.

LEAD NITRATE.—In steady demand and unchanged at £29 10s. per ton.

LITHOPONE.—Firm at £19 15s. to £23 per ton, according to grade and quantity.

POTASH CARBONATE.—£28 to £29 per ton for the 96/98%, arsenic free quality.

PERMANGANATE OF POTASH NEEDLE CRYSTALS B.P.—In good demand and firm at 5½d. per lb.

SODA BICHROMATE.—Unchanged and firm at 3⅜d. per lb. with usual discounts for contracts and in steady demand.

SODIUM HYPOSULPHITE COMMERCIAL CRYSTALS.—£8 10s. Photographic crystals, £14 15s. per ton.

SULPHIDE OF SODIUM.—Steady at £10 5s. to £11 5s. for solid and £11 5s. to £12 5s. for broken, carriage paid.

TARTAR EMETIC.—Remains steady at about 11d. per lb.

ZINC SULPHATE.—Rather quiet at £12 5s. per ton.

Coal Tar Products

There is no change in the prices or condition of the coal tar product market. Inquiry is still maintained, but as far as we can ascertain, little business is resulting.

MOTOR BENZOL.—Unchanged at about 1s. 5½d. to 1s. 6½d. per gallon f.o.r.

SOLVENT NAPHTHA.—Remains at about 1s. 2½d. to 1s. 3d. per gallon.

HEAVY NAPHTHA.—Quoted at about 1s. 1d. per gallon f.o.r.

CREOSOTE OIL.—Remains at 3d. to 3½d. per gallon f.o.r. in the North, and at 4d. to 4½d. per gallon in London.

CRESYLIC ACID.—Unchanged, at 1s. 8d. per gallon for the 98/100% quality, and at 1s. 6d. per gallon for the dark quality 95/97%.

NAPHTHALENES.—Quoted at £3 10s. to £3 15s. per ton for the fire-lighter quality, at about £4 to £4 5s. per ton for the 76/78 quality, and at about £5 per ton for the 76/78 quality.

PITCH.—Worth 37s. 6d. to 42s. 6d. per ton, f.o.b. East Coast port.

THE following additional prices have been received :—

Carbolic Acid.—Quiet with prices unchanged, small contracts being arranged at the price of 7½d. per lb., with larger quantities 7d. per lb.

Cresylic Acid.—Pale 97/99% at 1s. 10d. per gallon to 2s. per gallon ; refined, 2s. 5d. to 2s. 7d. per gallon ; dark, 95%, 1s. 6d. per gallon. Prices naked at works.

Aspirin and Salicylic Acid.—There are no changes in the prices of either of these materials, business being maintained at schedule prices.

Motor Benzol seems to have steadied itself after the reduction in petrol prices, and is quoted at 1s. 5d. to 1s. 5½d. per gallon.

Solvent Naphtha.—In good demand, and prices are regulated today at about 1s. 3d. per gallon.

Heavy Naphtha 90/190.—Quoted at 1s. 1d. per gallon.

Vanillin.—Unchanged.

Nitrogen Fertilisers

Sulphate of Ammonia.—*Export.*—The market continues dull, but producers are holding firm for £7/£7 5s. per ton, according to quantity, f.o.b. U.K. port in single bags for prompt shipment. It is not anticipated that there will be large inquiries until the consuming season is nearer at hand. *Home.*—The home price for October is £9 1s. per ton delivered in 6-ton lots to farmer's nearest stations, but there is little interest at present.

Nitrate of Soda.—It is reported from the United States that very little buying has followed the announcement of prices. Elsewhere there seems little interest at the moment in this product.

Latest Oil Prices

LONDON, October 15.—LINSEED OIL was firm and 5s. to 7s. 6d. per ton higher. Spot, ex mill, £26 10s. ; October, £24 ; November-December, £23 10s. ; January-April, £23 5s. ; May-August, £23, naked. RAPE OIL was dull at 20s. per ton decline. Crude extracted, £31 ; technical refined, £32 10s., naked, ex wharf. COTTON OIL was quiet, Egyptian crude, £23 10s. ; refined common edible, £28 10s. ; deodorised, £30 10s., naked, ex mill. TURPENTINE was quiet and 6d. per cwt. lower. American, spot, 34s. ; November-December, 34s. 3d. ; January-April, 36s. Russian, spot, 31s. 9d.

HULL.—LINSEED OIL, naked, closed for spot at £24 15s. ; October, £24 10s. ; November-December, £24 2s. 6d. ; January-April, £23 15s. ; May-August, £23 10s. COTTON OIL, naked, Egyptian crude, spot, £21 10s. ; deodorised, spot, £26 10s. ; edible refined, spot, £24 10s. ; technical, spot, £24 7s. 6d. PALM KERNEL OIL.—Crude, naked, 5½ per cent., spot, £23 10s. GROUNDNUT OIL.—Crushed/extracted, spot, £27 ; deodorised, spot, £31. SOYA OIL.—Extracted and crushed, spot, £24 5s. ; deodorised, spot, £27 15s. RAPE OIL.—Crushed/extracted, spot, £28 10s. ; refined, spot, £30 10s. per ton. TURPENTINE, spot, 36s. 3d. per cwt. CASTOR OIL and COD OIL unaltered. Net cash terms, ex mill.

South Wales By-Products

SOUTH WALES by-product activities remain unchanged. The pitch demand continues to be small and sporadic and big users like patent fuel manufacturers are evidently waiting for an improvement in the patent fuel demand. Pitch stocks are well in excess of the demand but quotations are unchanged. Refined tars continue to have a fair and steady call, with values unchanged for gasworks and coke-oven tar. Naphthas are quiet. Road tar has a moderate call at about 13s. per 40-gallon barrel. Creosote remains weak, but motor benzol is in fair request. Values are unchanged in both cases. Patent fuel and coke exports show no sign of improvement. Patent fuel prices for export are :—21s. 6d., ex-ship Cardiff ; 20s., ex-ship Newport ; 20s., ex-ship Swansea. Coke prices are :—Best foundry, 34s. to 36s. 6d. ; good foundry, 26s. to 30s. ; furnace, 17s. 6d. to 21s. 6d. Oil imports into Swansea during the four weeks period ending October 7th, amounted to 32,107,525 gallons—the biggest four weeks import this year.

Scottish Coal Tar Products

THERE is a continued absence of larger orders, but more interest is being shown and smaller orders are quite numerous. Cresylic acid is in better demand for export, but prices are unchanged.

Cresylic Acid.—Shipments are resuming gradually, but quotations continue easy ; pale, 99/100%, 1s. 9d. to 1s. 10d. per gallon ; pale, 97/99%, 1s. 8d. to 1s. 9d. per gallon ; dark, 97/99%, 1s. 7d. to 1s. 8d per gallon ; high boiling, 1s. 8½d. to 1s. 10½d. per gallon ; all ex makers' works naked.

Carbolic Sixties.—No business is being transacted and value is nominal at 2s. per gallon.

Creosote Oil.—While timber grades remain dull there is a moderate demand for gas works oil. Specification oil, 2⅞d. to 3d. per gallon ; gas works ordinary, 3¼d. to 3⅜d. per gallon ; washed oil, 3d. to 3¼d. per gallon ; all f.o.r. works in bulk.

Coal Tar Pitch.—Very few orders are reported and quotations are unchanged. Export value may be taken at 45s. to 47s. 6d. per ton f.a.s. Glasgow, while home price is 45s. per ton, ex works.

Blast Furnace Pitch.—Orders are for small quantities only. Controlled prices are unaltered at 30s. per ton f.o.r. works for home trade, and 35s. per ton f.a.s. Glasgow for export.

Refined Coal Tar.—Makers' prices are easy at 3d. to 3¼d. per gallon in buyers' packages free on rails.

Blast Furnace Tar.—Remains dull at 2⅞d. per gallon.

Crude Naphtha.—There is a steady demand at about 4d. per gallon f.o.r. works in bulk.

Water White Products.—Trading is on a small scale. Motor benzol is weak at about 1s. 5d. per gallon. Naphthas are still being offered at 1s. 2½d. to 1s. 3½d. per gallon for 90/160 grade, and 1s. to 1s. 1d. per gallon for 90/190 grade—all ex works in bulk.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing this firm's independent and impartial opinions.

Glasgow, October 14, 1930.

THE Scottish heavy chemical market for home and export inquiries is fairly regular. No exceptional business is reported.

Industrial Chemicals

ACETONE.—B.G.S.—£71 10s. to £80 per ton, ex wharf, according to quantity. Inquiry remains satisfactory.

ACID, ACETIC.—Prices ruling are as follows: glacial, 98/100%, £47 to £58 per ton; pure, £37 5s. per ton; technical, 80%, £36 5s., delivered in minimum 1-ton lots.

ACID, BORIC.—Granulated commercial, £22 per ton; crystals, £23; B.P. crystals, £31 per ton; B.P. powder, £32 per ton, in 1-cwt. bags, delivered free Great Britain in one-ton lots upwards.

ACID, HYDROCHLORIC.—Usual steady demand. Arsenical quality, 4s. per carboy. Dearsenicated quality, 5s. per carboy, ex works, full wagon loads.

ACID, NITRIC, 80° QUALITY.—£23 per ton, ex station, full truck loads.

ACID, OXALIC.—98/100%.—On offer at the same price, viz.: 3¼d. per lb., ex store. On offer from the Continent at 3⅛d. per lb., ex wharf.

ACID, SULPHURIC.—£3 2s. 6d. per ton, ex works, for 144° quality; £5 15s. per ton for 168°. Dearsenicated quality, 20s. per ton extra.

ACID, TARTARIC, B.P. CRYSTALS.—Quoted 11½d. per lb., less 5%, ex wharf. On offer for prompt delivery from the Continent at 1s. per lb., less 5%, ex wharf.

ALUMINA SULPHATE.—Quoted at round about £8 15s. per ton, ex store.

ALUM, LUMP POTASH.—Now quoted £8 7s. 6d. per ton., c.i.f. U.K. ports. Crystal meal, about 2s. 6d. per ton less.

AMMONIA ANHYDROUS.—Quoted 10½d. per lb., containers extra and returnable.

AMMONIA CARBONATE.—Lump quality quoted £36 per ton. Powdered, £38 per ton, packed in 5 cwt. casks, delivered U.K. stations or f.o.b. U.K. ports.

AMMONIA LIQUID, 880°.—Unchanged at about 2½d. to 3d. per lb., delivered, according to quantity.

AMMONIA MURIATE.—Grey galvanisers' crystals of British manufacture quoted £21 to £22 per ton, ex station. Fine white crystals offered from the Continent at about £17 5s. per ton, c.i.f. U.K. ports.

ANTIMONY OXIDE.—Spot material obtainable at round about £31 per ton, ex wharf. On offer for shipment from China at about £29 per ton, c.i.f. U.K.

ARSENIC, WHITE POWDERED.—Quoted £19 per ton, ex wharf, prompt shipment from mines. Spot material still on offer at £20 5s. per ton, ex store.

BARIUM CHLORIDE.—In good demand and price about £11 per ton, c.i.f. U.K. ports. For Continental material our price would be £10 per ton, f.o.b. Antwerp or Rotterdam.

BLEACHING POWDER.—British manufacturers' contract price to consumers unchanged at £6 15s. per ton, delivered in minimum 4-ton lots. Continental now offered at about the same figure.

CALCIUM CHLORIDE.—Remains unchanged. British manufacturers' price, £4 15s. to £5 5s. per ton, according to quantity and point of delivery. Continental material on offer at £4 15s. per ton, c.i.f. U.K. ports.

COPPERAS, GREEN.—At about £3 15s. per ton, f.o.r. works, or at £4 12s. 6d. per ton, f.o.b. U.K. ports.

FORMALDEHYDE, 40%.—Now quoted £33 per ton, ex store. Continental on offer at about £32 per ton, ex wharf.

GLAUBER SALTS.—English material quoted £4 10s. per ton, ex station. Continental on offer at about £3 per ton, ex wharf.

LEAD, RED.—Price now £33 per ton, delivered buyers' works.

LEAD, WHITE.—Quoted £46 per ton, c.i.f. U.K. ports.

LEAD, ACETATE.—White crystals quoted round about £39 to £40 per ton ex wharf. Brown on offer at about £2 per ton less.

MAGNESITE.—GROUND CALCINED.—Quoted £9 per ton, ex store. In moderate demand.

METHYLATED SPIRIT.—Industrial quality 64 o.p. quoted 1s. 8d. per gallon less 2½% delivered.

POTASSIUM BICHROMATE.—Quoted 4½d. per lb., delivered U.K. or c.i.f. Irish ports, with an allowance for contracts.

POTASSIUM CARBONATE.—Spot material on offer, £25 10s. per ton ex store. Offered from the Continent at £24 15s. per ton, c.i.f. U.K. ports.

POTASSIUM CHLORATE, 99¾/100% POWDER.—Quoted £26 5s. per ton ex store; crystals 30s. per ton extra.

POTASSIUM NITRATE.—Refined granulated quality quoted £20 17s. 6d. per ton, c i.f. U.K. ports. Spot material on offer at about £20 10s. per ton ex store.

POTASSIUM PERMANGANATE B.P. CRYSTALS.—Quoted 5½d. per lb., ex wharf.

POTASSIUM PRUSSIATE (YELLOW).—Spot material quoted 7d. per lb. ex store. Offered for prompt delivery from the Continent at about 6¾d. per lb. ex wharf.

SODA CAUSTIC.—Powdered 98/99%, £17 10s. per ton in drums, £18 15s. in casks. Solid 76/77% £14 10s. per ton in drums, £14 12s. 6d. per ton for 70/72% in drums, all carriage paid, buyer's station, minimum four-ton lots. For contracts 10s. per ton less.

SODIUM BICARBONATE.—Refined recrystallised, £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Quoted 3⅜d. per lb., delivered buyer's premises, with concession for contracts.

SODIUM CARBONATE (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station; powdered or pea quality, 27s. 6d. per ton extra. Light soda ash, £7 13s. per ton, ex quay, minimum four-ton lots, with various reductions for contracts.

SODIUM HYPOSULPHITE.—Large crystals of English manufacture quoted £8 17s. 6d. per ton, ex station minimum four-ton lots. Pea crystals on offer at £14 15s. per ton, ex station, minimum four-ton lots.

SODIUM NITRATE.—Chilean producers now offer at £10 2s per ton, carriage paid, buyer's sidings, minimum six-ton lots, but demand in the meantime is small.

SODIUM PRUSSIATE.—Quoted 5½d. per lb., ex store. On offer at 5d. per lb., ex wharf, to come forward.

SODIUM SULPHATE (SALTCAKE).—Prices, 55s. per ton, ex works; 57s. 6d. per ton, delivered for unground quality. Ground quality 2s. 6d. per ton extra.

SODIUM SULPHIDE.—Prices for home consumption: solid 61/62%, £10 per ton; broken, 60/62%, £11 per ton; crystals 30/32%, £8 2s. 6d. per ton, all delivered buyers' works on contract, minimum four-ton lots. Special prices for some consumers. Spot material 5s. per ton extra. Crystals 2s. 6d. per ton extra.

SULPHUR.—Flowers, £12 per ton; roll, £10 10s. per ton; rock, £9 5s. per ton; ground American, £9 5s. per ton, ex store.

ZINC CHLORIDE 98%.—British material now offered at round about £20 per ton, f.o.b. U.K. ports.

ZINC SULPHATE.—Quoted £12 per ton, ex wharf.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Physical and Optical Societies

Preparations for Annual Exhibition

THE Twenty-first Annual Exhibition of Electrical, Optical and other Physical Apparatus is to be held by the Physical Society and the Optical Society on January 6, 7 and 8, 1931, at the Imperial College of Science and Technology, South Kensington. As on previous occasions, there will be a Trade Section and a Research and Experimental Section. The Section for the work of Apprentices and Learners, introduced at the last exhibition, is to be continued. The Trade Section will comprise the exhibits of manufacturing firms, and preliminary invitations to these exhibitors are being issued, entries being asked for by October 24.

The Research and Experimental Section will be arranged in three groups: (*a*) Exhibits illustrating the results of recent physical research; (*b*) lecture experiments in physics; (*c*) historical exhibits in physics. The Exhibition Committee invites offers from research laboratories and institutions and from individual research workers, of exhibits suitable for inclusion in any of these three groups. Accommodation for the exhibits will be provided in rooms separate from those devoted to the trade exhibits, and a part of the catalogue will be devoted to their description. No charge will be made for space or catalogue entries in the Research and Experimental Section.

Offers of exhibits, giving particulars of space and other facilities required, should be communicated immediately to the Secretary, Exhibition Committee, 1, Lowther Gardens, Exhibition Road, London, S.W.7.

The Section for Apprentices and Learners has for its object the encouragement of Craftsmanship and Draughtsmanship in the scientifie instrument trade. Apprentices and learners may exhibit, in competition, specimens of their work, providing they are in the regular employ of a firm which is exhibiting at the next annual exhibition, or has exhibited once during the past three years.

Manchester Chemical Market

(From Our Own Correspondent.)

Manchester, October 16, 1930.

Whilst few cases of fresh weakness have developed in the chemical market here during the past week, the tendency in respect of a number of products can hardly be described as strong, and buying of these is of a strictly hand-to-mouth nature in consequence. Cotton trade prospects in some of the important export markets are believed to be somewhat brighter, and interest has been aroused by the reopening of various mills after prolonged stoppages. If this continues some improvement should be experienced in the demand for chemicals for use in the textile finishing and allied trades.

Heavy Chemicals

No more than a moderate business has been passing this week in phosphate of soda, current offers of which are in the neighbourhood of £10 per ton for the dibasic quality. A quietly steady trade is reported in the case of prussiate of soda, values of which are well held at from 4¾d. to 5¼d. per lb., according to quantity. There is a fair inquiry about for bicarbonate of soda, and prices are steady at £10 10s. per ton, alkali also moving in moderate quantities at round £6 per ton. The demand for hyposulphite of soda at the moment is on rather quiet lines, but at about £9 per ton for the commercial material and £15 15s. for the photographic there has been little alteration in prices. Buying in the case of chlorate of soda is slow, and further weakness has developed in this section, offers being at from £23 to £23 10s. per ton. Caustic Soda is in fair request, with contract quotations at from £12 15s. to £14 per ton, according to grade, and a fair inquiry is reported. Saltcake is moving off in moderate quantities at from £2 15s. to £3 per ton. Only a relatively quiet business is being put through in the case of sulphide of sodium, but there has been little change in price, the 60/65 per cent. concentrated material being quoted at round £8 10s. per ton and the commercial grade at £7 10s. There is a fair demand about for bichromate of soda, prices of which are well held on the basis of 3⅜d. per lb., less 1 to 3½ per cent.

In the potash section, carbonate is displaying further ease, and offers are now at about £24 10s. per ton. Yellow prussiate of potash is well held at from 6¾d. to 7¼d. per lb., according to quantity, with the demand for this material on moderate lines. No more than a quiet trade is being done in chlorate of potash, values of which are no better than about £25 per ton. Bichromate of potash is unchanged at 4½d. per lb., less discounts of 1 to 3½ per cent., a quietly steady business being reported. Current offers of caustic potash are at from £28 to £29 per ton, sales being of limited extent. With regard to permanganate, values are steady at round 5½d. per lb. for the B.P. grade and 5¼d. for the commercial.

There has been little actual change on balance in the price of sulphate of copper, although in view of the position of the metal the outlook in this respect continues uncertain; to-day's rates are at round £21 per ton, f.o.b. Arsenic keeps steady at the higher level of £17 per ton at the mines for white powdered, Cornish makes, moderate sales being made. The lead compounds are weak in tendency at about £34 10s. per ton for the brown acetate and £35 10s. for the white, with nitrate quoted at round £29. There is a quiet demand about for the acetates of lime at £14 per ton for the grey material and £7 5s. for the brown.

Acids and Tar Products

Moderate sales of acetic acid are reported, and values are held at £37 per ton for the 80 per cent. commercial grade and from £47 to £51 per ton for the glacial. Tartaric acid continues slow and easy at from 11d. to 11½d. per lb., with citric acid also in quiet demand at about 1s. 6d. Oxalic acid is fairly steady at £1 12s. per cwt., ex store, but there has been no improvement in the weight of business going through.

Among the by-products, pitch is in moderate request, with export values at from 45s. to 47s. 6d. per ton, f.o.b. Creosote oil is well held at up to 4½d. per gallon, naked, at works, and a fair trade is being done. Offers of solvent naphtha are fully maintained at round 1s. 3d. per gallon, naked. There is not much doing in the case of carbolic acid, with crude 60's material at about 1s. 7d. per gallon, naked, and crystals at 6½d. to 7d. per lb., f.o.b.

Company News

British Drug Houses, Ltd.—An interim dividend of 2 per cent. on the ordinary shares, is announced, payable on November 1.

Borax Consolidated.—The directors state that they have decided to postpone the payment of the preferred ordinary dividend, due on November 1.

Sadler and Co.—The report for the year ended June 30, 1930, states that the balance standing at the credit of profit and loss account, including balance brought forward from the previous year, is £9,962, out of which it is proposed to pay a dividend of 5 per cent., less income tax, £6,551, leaving to be carried forward £3,411. The annual meeting will be held at Royal Exchange, Middesbrough, on October 20, at 2.15 p.m.

"C.A." Queries

We receive so many inquiries from readers as to technical, industrial, and other points, that we have decided to make a selection for publication. In cases where the answers are of general interest, they will be published; in others, the answers will simply be passed on to the inquirers. Readers are invited to supply information on the subjects of the queries:—

158. (*Synthetic camphor powder.*)—The names and addresses are required of manufacturers of synthetic camphor powder.

Imports of Nitro-cellulose Lacquers in New Zealand

Great Britain supplies 50 per cent. of the nitro-cellulose lacquers which are imported into New Zealand in steadily increasing quantities and of which there are no home supplies. The Government import statistics do not classify these lacquers separately, so that it is impossible to state the annual consumption, but the figures for the cellulose lacquer, varnish and gold size group were 57,192 gallons in 1927, 65,736 in 1928, and 76,681 gallons for 1929. The share of the United States is about 34 per cent. and practically all of the numerous brands of lacquers found on the market are of American manufacture or produced in England or Australia under American patented processes. The motor industry is the largest consumer of the commodity, there being over 157,000 motor vehicles registered in New Zealand, and utilisation of lacquers by furniture factories is also advancing. Other uses, although relatively small, are by tin ware manufacturers and for household purposes.

Hydrogenation Research in Alberta

The Acting High Commissioner for Canada in London has received from the Research Council of Alberta at Edmonton a copy of Report No. 25, being the "Tenth Annual Report of the Scientific and Industrial Research Council of Alberta, 1929," which can be consulted by persons interested at the Canadian Building, Trafalgar Square, London, S.W.1.

Investigations carried on in the Province during the year included a number of hydrogenation tests with samples of Alberta coal, as well as with tar reduced from bituminous sands. Work was also carried on in connection with the chemical utilisation of natural gas, of which enormous quantities are going to waste, particularly in southern Alberta. The report contains records of the work done during the year by the various divisions dealing with the investigation of fuels, road materials, natural gas research and geological and soil surveys.

Polish Paint and Varnish Industry

Practically all the Polish paint and varnish plants, which now number 30 (in place of 7 before the war), are at present suffering from overproduction and severe inland competition, writes the U.S. Commercial Attaché at Warsaw. Export markets are difficult to obtain, owing to the competition of German products, whose basic raw material costs are 50 per cent. cheaper. A special agreement has been drawn up regulating the commercial aspect of the industry, and thereby enabling the different factories to adjust their business to the new conditions. This movement is expected to improve profits, which averaged only 5 per cent. during the operating year 1928–29.

New Chemical Trade Marks

Applications for Registration

These lists are specially compiled for us from official sources by Gee and Co., Patent and Trade Mark Agents, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer any inquiries relating to Patents, Trade Marks and Designs.

Opposition to the Registration of the following Trade Marks can be lodged up to November 8, 1930.

ORTOXIN.

503,025. Class 1. Chemical substances for use in manufacture in sizing and finishing artificial silk. I.G. Farbenindustrie Aktiengesellschaft (a joint stock company organised under the laws of Germany), Mainzerlandstrasse 28, Frankfurt-on-Main, Germany; manufacturers. May 24, 1929. (By consent.)

REGGALAC.

513,413. Class 1. Cellulose lacquers. British Cellulose Lacquers, Ltd., 5, Marshgate Lane, Stratford, London, E.15; manufacturers of lacquers. May 31, 1930.

DUROFUR.

514,719. Class 1. Chemical substances used in manufactures. British Dyestuffs Corporation, Ltd., Hexagon House, Blackley, Manchester; manufacturers. July 19, 1930. To be associated with No. 514,720 (2,736) iv.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal" have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

MEXICO.—A firm in Guadalajara desires to represent British manufacturers of glass, paints and varnishes, and sanitary ware. (Ref. No. 350.)

SOUTH AFRICA.—The Railways and Harbour Board is calling for tenders to be presented in Johannesburg by November 17 for the supply of air compressors. (Ref. No.A.X. 10,297.)

Tariff Changes

FRANCE.—By a Decree dated October 3, a licence is now required for the import of glues, gelatine, oleine and stearine and oleic and stearic acids when originating in or coming from the Union of Soviet Republics.

NIGERIA.—The following increases in the Customs import duties came into force on September 27. Soap raised from 4s. per cwt. to 4s. per 100 lb.; salt (other than table salt), from 2s. per cwt. to 2s. per 100 lb.; cement from duty free to 3d. per 100 lb.; matches from 2s. 6d. to 3s. per gross boxes.

TURKEY.—As the result of the Treaty with Germany reductions are now in effect on the import duties on certain colours, inks, chemicals and medicinal and chemical specialities.

Arsenic Production in Canada

THE Dominion Bureau of Statistics at Ottawa reports that arsenic production from Canadian ores in 1929 amounted to 5,230,088 pounds, worth $171,320, as against 5,432,223 pounds, valued at $193,052, in 1928. Ontario mines yield the larger part of Canada's arsenic output. Silver-cobalt ores are smelted at Deloro, Ontario, and from these white arsenic and arsenic-bearing speiss residues are obtained.

In British Columbia the ores of the Nickel Plate mine at Hedley furnish all of the arsenic reported from that province. Arsenic-bearing concentrates from this mine are delivered to the smelter at Tacoma, Washington, for treatment. In Canada arsenic is used in the manufacture of paris green, lead arsenate, lime arsenate, sheep dips and other insecticides. Other uses are found in the manufacture of glass and to a small extent in medicinal and pharmaceutical preparations. Most of the market is found in the export trade; the United States uses large quantities as a means of fighting the boll-weevil, which is so destructive of the cotton crop.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette, &c.

Company Winding Up

METAL ORE AND CHEMICAL CO., LTD. (C.W.U., 18/10/30.) Winding-up order, October 14.

Companies Winding Up Voluntarily

YORKSHIRE AND LINCOLNSHIRE TAR DISTILLATION CO., LTD. (C.W.U.V., 18/10/30.) By special resolution, October 3. T. W. Howard, Castle View, Conisborough, near Rotherham, company secretary, appointed as liquidator.

SANITARY PAINT CO., LTD. (C.W.U.V., 18/10/30.) By special resolution, October 8. E. T. Nicholson, 24, North John Street, Liverpool, chartered accountant, appointed as liquidator.

Bankruptcy Information

WALTON A., AND CO., Bridge Mills, Tarvin Road, Boughton, Cheshire, soap manufacturers. (R.O., 18/10/30.) Receiving order, October 7, creditor's petition.

Receivership

ESSEX FIRE EXTINGUISHER CO., LTD. (R., 18/10/30.) H. W. Batty, of 14, Clifford Street, W.1, was appointed receiver and manager on October 3, 1930, under powers contained in debentures dated February 20, and July 15, 1930.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

IDEAL CLEANERS AND DYERS, LTD., London, W. (M., 18/10/30.) Registered October 1, £15,000 debentures, to Frances M. M. Hibbert, Nepaul Private Hotel, Croft Road, Torquay, and another; general charge. *£25,000. March 22, 1930.

SAVORY AND MOORE (1928) LTD., London, W., manufacturing chemists. (M., 18/10/30.) Registered October 9, £50,000 debentures (supplemental to £45,000 debentures dated January 21, 1929), to Barclays Bank, Ltd.; general charge. *£90,000. August 19, 1930.

Satisfaction

IDEAL CLEANERS AND DYERS, LTD., London, W. (M.S., 18/10/30.) Satisfaction registered October 2, £2,000 (not ex.), registered June 10, 1929.

New Companies Registered

THE DUROLAVE PAINT AND VARNISH CO., LTD.—Registered as a "private" company on October 8. Nominal capital, £50,000 in £1 shares. To acquire the assets or part of the goodwill and undertaking of the Walpamur Company, Ltd., and the trade marks relating thereto, including the trade mark "Durolave," and to carry on the business of manufacturers of and dealers in washable distempers, water and oil colours, varnishes, paints, enamels, pigments, paint bases, white and other leads, dryers, painters' oils, lubricating and other oils, inks, stains, colouring matters, dyes, sizes, glues, paste, brushes, etc. A subscriber: J. G. G. Mellor, Knipoch, by Oban.

PHARMACEUTICAL SUPPLIES, LTD., 120, Victoria Street, London, S.W.1.—Registered October 8. Nominal capital, £1,250 in 10s. shares. Manufacturing wholesale and retail chemists and druggists, etc.